PUBLICATION OFFICES
168-177 POTTER BUILDING, NEW YORK.
Telephone Call: Murray 586. Cable Address: "Electrical," New York.
W. J. JOHNSTON, Editor and Publisher.
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CONTENTS.

ILLUSTRATED ARTICLES: PAGE

Noble's Double Arc Lamp.. 290
Patten's Electric Recording Target 290
The C. & C. Motor Company at the Electrical Exhibition 291
A Novel Electric Gas Alarm 292
Houston's Iron-Clad Motor.. 292
The Wilson & Hard New Medical Apparatus 293
Marshall's Condensers at the Electrical Exhibition..... 294
The Exhibit of the E. P. Gleason Manufacturing Company 295
The Stratton Separator at the Electrical Exhibition. 295

CORRESPONDENCE:

The Evolution of the Iron-Clad Dynamo 292
Electromotive Force of the Water Battery..... 292
The New York Telephone Investigation..... 293

EDITORIAL PARAGRAPHS..... 289

MISCELLANEOUS: PAGE

Electricity at the Proposed International Exhibition at Brussels 293
Notes on the American Institute Electrical Exhibition..... 294
The Manufacture of Silicon Bronze Wire..... 294
Electrical Utilization of Water Power at Sault Ste. Marie..... 29
A Review of Certain Claims to the Art of Telephony... 295

DEPARTMENTS:

New York Notes. 298
New England Notes 298
Western Notes 298
Pacific Slope Notes... ... 299
The Telegraph..... 299
The Telephone 299
The Electric Light..... 299
Applications of Power..... 300
Miscellaneous Notes..... 300
Personals.. 300
Business Notices... 300
Our Illustrated Record of Electrical Patents. 300

New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

PAGE.

Charles L. Ireson.—Ireson's Self-Adjusting Leather Link Belting i
The E. S. Greeley & Co.—Cleveland Arc and Incandescent Switches i
Thomson-Houston Electric Co.—System of Arc and Incandescent Lighting, Electric Motors for Stationary and Street Railway Use ii
The Electric Gas-Lighting Co.—The "Single Magnet" Ratchet Automatic Electric Burner..... vii
Central Electric Co.—Learners' Instruments..... xv
Russell & Erwin Manufacturing Co.—Bells, Bell-Pulls and Push Buttons..... xvi
Western Electric Co.—Kerite Wire for Sale..... xvi
Fuller, Holtzer & Co.—Patent Electric Lock xvi
C. & C. Electric Motor Co.—Electric Motors for any Circuit xvii
Wants, For Sale and Special Notices..... ix

VOL. X. NEW YORK, DEC. 3, 1887. No. 23.

WE print this week another letter from Mr. Rudolf Eickemeyer in relation to the iron-clad dynamo, in which he maintains his original position regarding his priority of invention of that type of machine. In order to elucidate this vexed topic, we give a description and illustration of the machine designed by Prof. Houston, who also claims a share in the invention of that type of apparatus.

WE publish on another page a few notes from the prospectus of the International Exhibition to be held at Brussels next year. It will be seen that the phraseology is somewhat peculiar, smacking very much of the style of "English as she is spoke." As there are many well-known Belgian electricians on the committee for the electrical section, it is a pity that the English version of the official document was not subjected to revision by a competent hand. We shall be glad to learn of the success of the exhibition and to assist it in any fitting way.

A NEAT idea in the application of electricity to warfare is found in the use of incandescent lamps of about 100 candle power placed on poles submerged to a depth of about twenty feet in the sea, and carried by launches These lights illuminate the sea within a radius of 150 feet, and thus help to detect submarine mines, torpedo lines, etc. The experiments have been made at the Newport torpedo station, and promise good results. The launches need not reveal their presence, for the lights are buried under the water and can be operated by storage batteries.

IT was thought that when the telephone cases reached the United States Supreme Court there would be an end to controversy on the subject outside, but the expectation has been more than once disappointed. This week we publish, from the able pen of Mr. Frank W. Jones, a summary of certain claims to the art of telephony; and what he has to say will be noted with interest though it may not serve to convince. Another sign of activity is the statement from Washington that Mr. Elisha Gray is to be heard by the Commissioner of Patents in regard to his desire to amend the application of Oct. 29, 1877, by inserting therein the important word "metallic" before "diaphragm."

Now that the use of alternating currents has assumed so important an aspect in the commercial sense, renewed and greater interest is taken in the scientific questions connected with the matter. It will be remembered that last May Prof. Elihu Thomson read before the American Institute of Electrical Engineers a paper that has become a classic, on the phenomena of alternating currents, giving a marked stimulus to their study. We are now glad to learn that Mr. William Stanley, Jr., will take up another branch of the same subject before the Institute next week. Mr. Stanley has been an original worker in this field for some time past, and the views and data he may have to present in regard to these phenomena will be received with the utmost attention.

IN 1890 will end the term of 100 years during which the cities of Boston and Philadelphia have each enjoyed the revenue from a bequest of $5,000 made by Benjamin Franklin. The money was to be loaned out to young married artificers, and the trust has been executed, although the lapse of the century requires a new disposition of the funds. It is significant that while in Boston the $5,000 has grown to nearly $328,000, in Philadelphia the $5,000 has become only $70,000, and that in both cases the amount is less than Franklin estimated it should be. But as the natural philosophers of Franklin's day generally fell short of the sage in ingenuity, so too the successive boards of trustees have been far from equal to him in business ability. It is interesting to note, however, that the two funds still exist, and that part of the Boston reserve goes in the purchase of a public recreation ground to be known as Franklin Park.

THE Board of Subway Control, arrived at the verge of winter when its effodient operations must cease for a while, is pointing with pride to what it has already accomplished. It is now stated with some degree of confidence that the removal of all the wires overhead is only a question of time, say three or four years. The poles are to be gathered in forthwith in many places, and the subways are to be occupied in their stead. Credit must be given, then, to the subway authorities for the work they have done, even if their efforts show no material gain on the ever-increasing wireage in this city. A large amount of subway construction is recorded, and that much is to be taken as an advance, despite the undeniable fact that the Board is only supervising what is really an experiment. Provision has at least been made for a large number of telephone wires, and a considerable section of uptown New York has been covered with the necessary network for incandescent lighting.

ALTHOUGH Mr. Sunny recently advised the telephone companies and electric light companies to abandon their prejudices against each other, his pithy and pertinent advice has not been heeded everywhere. In New Orleans the telephone company is seeking to prevent the local Brush Company from using alternating current apparatus, on the ground of its danger. New Orleans has had lately several accidents attributed to the introduction of the alternating system, and the telephone company and its employés appear to have been the chief sufferers. It would be hasty to assume, however, as the telephone company does, that the system is in and of itself so bad that it cannot be tolerated. This was assumed in regard to arc lighting, but the arc is still here and grows in favor with all men, including gas magnates. Still, out of this suit good may come if it serves to bring forth information on the questions connected with the safety of the alternating system for general purposes, and if it emphasises the necessity for good, thorough work in wiring.

A LARGE number of the operators of the Baltimore & Ohio Telegraph Company, and not a few of their chiefs, have been thrown out of employment by the recent turn of affairs. They are entitled to all help and sympathy, for the consolidation is due to no fault or wish of theirs. In fact, there was every justification for the belief on their part that the positions they occupied were permanent, and that promotion was in store for the more deserving. But now that the change has come, it adds special point to the advice we have so often given young telegraph operators, to qualify themselves by study and experiment for other kinds of work than those to which they are accustomed. The operators who have laid such advice to heart are the men who will fare best in this emergency. They will not settle back into inferior positions outside telegraphy in dumb despair; nor will they crowd into the swollen ranks of the old company. They are able to strike boldly afield in the new departments of light and power, and find that their old occupation serves them in good stead, from the experience it has afforded them with wires, magnets and circuits. As they take up their new occupations, they are encouraged by the examples abounding of operators who have already attained prominence in the wider applications of electricity.

WHILE the insurance companies concede that the electric light, when properly installed, is the safest of all illuminants, they naturally find it incumbent upon them to adopt rules which will insure the proper operation of plants. As the rules multiply we note that they become more and more stringent, and that precautions formerly deemed unnecessary, or at least tacitly implied, are now distinctly designated. Thus the rules of the Boston Fire Underwriters' Union, recently published, give a long list of precautions to be observed. In these, and in others of recent origin, may be seen unmistakably the tendency to abolish all hidden wire-work and to insist upon the placing of wires so that they can be readily reached for examination. Excellent as may be the intent of this rule, there can be no doubt that its adoption has been brought about by the ignorance or negligence of some who have been engaged in the wiring of buildings. There seems to be no good reason why an electric wire should be placed in sight any more than that a gas pipe should be exposed to view. One can be made as safe as the other, and in the case of the wire it is only a question of material and its proper installation. There are to-day many successful examples of interior wiring to demonstrate the unwisdom of insistence on such a rule. A far better method would be the enforcement of rigid inspection and test of installations while they are in course of construction. The "inspection" of interior wiring after the work has been completed and concealed, as often practiced, naturally leads to the practice of introducing inferior material and bad workmanship which become apparent after the lapse of time. While, as a rule, the regulations of the various companies agree pretty closely even to details, we have noted a peculiar difference on a small, though important detail relating to the soldering of wires. Thus, some companies prohibit the use of acid for soldering joints, stipulating rosin, while others insist upon acid to the exclusion of rosin. The reason why acid is prohibited is obvious, though with the exercise of care, its use ought to entail no evil consequences. It would be interesting to compare the results of experience in the use of the two materials, and thus to determine the true value of each.

NOT long since we published the decision of the United States Circuit Court for the Western District of Michigan, to the effect that the city of Grand Rapids in granting an exclusive franchise to a local electric light company had not exceeded its powers. The following item from the *Industrial World* is of special interest therefore: "The Court of Appeals of West Virginia last week decided a case of much importance, involving a question of the right of the City of Parkersburg, in that State, to employ electric lights to light the streets and public buildings there. It appears from the testimony that some years ago the City Council of Parkersburg passed an ordinance authorizing a gas company to light the city for a term of years. Recently the City Council authorized an electric light company using the Westinghouse system to light the streets, alleys and public buildings in that city. When the electric light company commenced putting up its poles and wires the gas company applied for and obtained an injunction in the State Circuit Court to restrain the former company from putting in its lights for public or private service. According to a special dispatch in the Pittsburgh *Gazette* from Parkersburg, we learn that the State Court, Judge Jackson, decided that the contract entered into by the city with the gas company was binding, and that no other company could light the city until the gas company's contract had expired, but that the electric light company could light the private buildings. Neither company was satisfied with the decision, so the case was taken to the Supreme Court, which has just decided that the contract made with the gas company is not such a one as precludes the council from contracting with the electric company for street or other public purposes. As the gas company contract would not have expired for nearly ten years, the effect of the decision is to give this city electric light in the streets at once. It also denies the right of a city council to give an exclusive contract for lighting purposes to any company." As we remarked before, this question of exclusive franchises is highly important, and it is well to know what the courts think about it, even when they do not agree. It will be noted that the opinion of the highest Court in West Virginia, while of a sweeping character, does not conform with that delivered by the United States Court in Michigan.

Noble's Double Arc Lamp.

Our illustration represents a new double arc lamp invented by Mr. Clarence B. Noble, of Cleveland, O., and embodying several novel features of construction. Referring to the drawing it will be seen that *A* and *B* represent the usual fine and coarse wire magnets which act differentially on a common core. Pivoted to the core and to a standard *G* is a bar, to which, between its pivots, is attached a horizontal bar *K*, extending at right angles beneath the former. The clutches *d d'* are supported on the ends of hooked links *P P'*, which are suspended from the extremities of U-shaped formations on the ends of a lever *h*, which latter is pivoted to an extension *E* of the standard *G*. The lever *h* is normally tilted so that one end, that for instance which supports the clutch *d*, is lower than the other, being under tension from a spring *Y'*. The construction is such that one end of the bar *K* rests normally directly under the clutch *d*, while the other end is considerably below the clutch *d'*. As a consequence, only the rod *T* will be acted on when the bar *K* is lifted to establish the arc. It will be understood that the hooked link *P* supports the ring clutch in a horizontal position and that a tilting of the clutch in a horizontal position to grasp the carbon takes place when the bar strikes against the clutch.

It will also be seen that the lever *h* is connected with the movable core *b* of magnet *D*. This magnet is wound with both fine and coarse wire, the fine wire being in the same shunt around the arc with magnet *B*, and the coarse wire forming a part of the main circuit. The core *b* carries a projection which plays between two pair of contacts *a' a''* and *o* and *a*. The contact *a* is the terminal of the coarse wire coil on magnet *D*, and the others are pieces separately supported by an insulating block, as shown.

The main circuit enters the lamp at +, and after passing around the magnet *A* branches at *A'*; one branch 1 going to contact *a''* and the other 2 to the coarse coil of magnet *D*. The course taken by the current depends on the position of the strip *b'* with reference to the contacts, as will be explained presently.

The normal position of the core *b* is down. The current in passing through the lamp energizes magnet *A*, lifts its core, and accordingly the bar *K*. The latter tilts the clutch *d*, which grips the rod and causes it to rise and establish the arc. As the carbons are consumed and the resistance becomes greater, more of the current is shunted into magnet *B*, which operates on the core in the usual way, and lowers the bar *K*, allowing the rod to feed. The course of the current is now as follows: From + through magnet *A*, out at *A'* and along branch 1 to contact *a''*, through strip *b'* to contact *a'*, to upper carbon, to lower carbon and to —.

When the arc is established the movement of the bar *K* is not great enough to impinge against the ring *d'*, and so rod *T* and the carbons *x* only are separated. When, however, the carbons are nearly consumed, the resistance increases abnormally, and the current in the shunt becomes stronger, so that magnet *D* becomes sufficiently energized to lift its core and the strip *b'* from contacts *a'* and *a''*. The full current then passes through the shunt wire, drawing core *b* up until strip *b'* makes contact with *o* and *a*. When this contact is made, the main current then passes over branch wire 2, through the coarse coil on magnet *D*, contact *a*, to strip *b'*, contact *o* to the carbons *x'* and thence to—. The heavy current now passing through magnet *D* holds the strip *b'* against the contacts.

The lifting of the core *b* also causes the tilting of lever *h* to a horizontal position so that ring *d'* is brought within the movement of bar *K*, and as *h* becomes horizontal at the same time core *b* is elevated, the ring *d'* will be lowered upon the bar *K* and be tilted to grip the rod, while the ring *d* will be lifted away from the bar *K*. The parts are adjusted so that the point at which this rod is elevated by bar *K* will be the point at which the arc is established. The carbons *x'* will now be consumed and fed in the same manner as the carbons *x*.

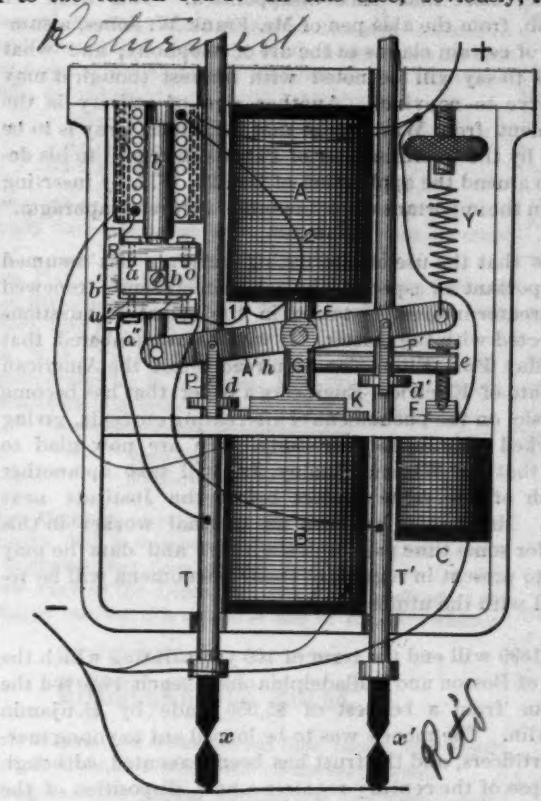
The main core is slotted, and a block is inserted into the slot and hung on a pin which passes laterally through the core and projects through its side, where it has secured to it an arm *e*. The block is also slotted to allow a pin to slide within it, and it has an enlarged base which extends out beyond the core to rest on the head of the magnet *B*. The arm *e* extends out and over the spring armature *F* of a magnet *C*, which is secured to the lamp frame. The armature is of insulating material but has a piece of metal secured to its lower face, and is further provided with a contact which engages with another on the head of the magnet *C*, the latter contact being one of the terminals of the magnet. The terminals are, therefore, in a branch circuit around the lamp from + to —, as shown.

Now when the second set of carbons *x'* are burned out the resistance becomes excessive and the magnet *B* draws its core down, allowing the arm *e* to force the spring *F* down so that contact is made with between the metal pieces below. The lamp is thus cut out or short circuited, and so long as the current passes through magnet *C* the armature *F* will be held down.

It will be noticed that the magnet *D* does not act to shift the lever *h* until the resistance of the carbons *x* becomes excessive owing to the complete or nearly complete exhaustion of the carbons or of one of them. Under other conditions the spring *Y''* counterbalances the pull of the magnet.

During the consumption of the first set of carbons, the carbons of the second set are in contact, the upper carbon being supported by the lower, and thus the arc-establishing and feeding magnets are relieved of their weight. Similarly, while the second set is being consumed, the unused stub of the upper carbon of the set *x* is resting on the lower carbon. In each instance the clutch of the set not in use is raised out of the path of the bar *K*.

It is evident that the contacts *a'* and *a''* may be dispensed with, and that the branch 1 may run directly from *A'* to the carbon rod *T*. In this case, obviously, there

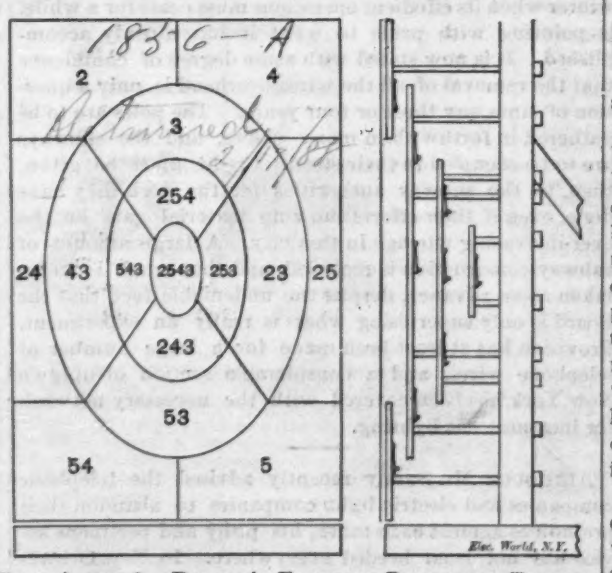


NOBLE'S DOUBLE ARC LAMP.

would be a circuit through the first set of carbons, or what remained of them, after the second set began to burn, but the resistance of that circuit would be so great as practically to cut out the first set.

Patten's Electric Recording Target

With the improved construction of small arms, accurate firing with the infantry weapon has made corresponding advance, and nothing but the power of the weapon now places a limit to the distance at which an object can be hit



FIGS. 1 AND 2.—PATTEN'S ELECTRIC RECORDING TARGET.

by a qualified marksman. During the past five years the United States Army has done more than any other to demonstrate the possibilities of the rifle, and from spring to autumn target practice is the most conspicuous feature of the soldier's daily routine; so extended and so thorough is this regular practice that the need of some reliable automatic target capable of indicating instantly at the firing point the value and position of the hits upon its surface is strongly felt.

The idea of an electric annunciator target is not new, an English engineer having patented such a device as early as 1862. Since that time a number of inventors have turned their attention in this direction with varying success. The target of Lieut. F. Jarvis Patten, U. S. A., which is described below, departs from former lines of work in this field. Recognizing the perfect feasibility of obtaining through electrical circuits the indications required, Lieutenant Patten aims at a material reduction of the annunciator system by which the indications are transmitted, and, singularly enough, the regular service target lends itself quite readily to such a result.

Fig. 1 is a diagram of the short range service target. As will be seen, its face is subdivided by elliptical rings into four concentric areas in which the hits have a diminishing score value from the centre outwards. A hit in the bull's-eye counts 5. In the next outer ring a hit counts 4, in the next 3, and a hit beyond the outer elliptical ring counts 2. The shot values are, therefore, 2, 3, 4, 5 in regular order from periphery to centre.

It is not quite sufficient, however, to know in which ring of the target a shot has struck; something more than the mere score value must be indicated, for it is necessary to know whether in a given ring a shot was above or below a horizontal central line and whether to the right or left of a vertical one.

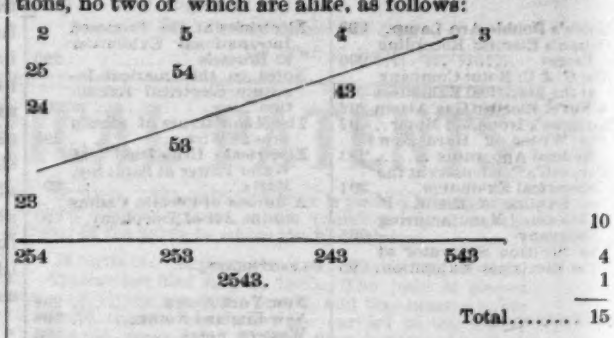
To effect this the target face is subdivided, as shown, into 15 subdivisions or areas. The bull's-eye remains intact, as it is quite sufficient to know that any part of the bull's-eye has been struck. The "three" and the "four" rings are, however, subdivided by diagonal lines into high and low, right and left quadrants each, while the outer "two" space is divided as shown into six parts.

In the practical target each of these 15 parts is represented by a separate independent steel plate, which is so connected in an electric circuit as to transmit, when struck, its own separate indication to the annunciator at the firing point.

Ordinary annunciator systems would, however, require 15 distinct circuits for this purpose, one complete circuit magnet and indicator for each separate plate of the 15 sections, making in all about 30,000 yards or 5 miles of wire to equip a single target for a thousand-yard range, and such a system would evidently place a recording target far beyond the limits of a reasonable cost.

The reduction of this system of wiring to a minimum without the use of costly transmitting devices is the most characteristic feature of Lieutenant Patten's system.

The system depends upon the application of a simple mathematical principle which finds such perfect adaptation that it would seem contrived for this special use. The score values, 2, 5, 4, 3, placed in the above order for a purpose may be regarded as four distinct and independent elements, and viewed as such they are susceptible, when taken first singly, then in groups of two, then in groups of three, and lastly altogether, of just 15 combinations, no two of which are alike, as follows:



It is evident that the fifteen plates of the target may be assigned each one of these fifteen numbers, and each will have a different number.

The bull's-eye is least hit, the largest number (2543) should therefore be assigned to it.

The "four" ring is the next least hit, and the four numbers, 254, 253, 243, 543, having each *three* figures, evidently belong in the four quadrants of the "four" ring. Thus each plate in the "four" ring has a designation number containing three figures, and the particular one of these tells at once the angle of the plate, or the quadrant of the ring struck. There are just four more mumbers of peculiar significance, 3, 23, 53, 43. They have *less* than three figures each, and all *end* in 3. Evidently these four figures should be assigned to the four quadrants of the "three" ring. The remaining six, 2, 5, 4, 25, 24, 54, belong to the six spaces of the outer "two" ring, and the entire fifteen plates of the target are numbered as shown in the diagram.

The four score values combined as shown may, however, be combined if represented by four different wires as well as four figures. The evident possibility of transmitting the fifteen different indications by means of four wires instead of fifteen is thus seen at a glance, all that is required for this purpose being some type of combination circuit key attached to each plate in such a way that when any plate is struck the proper combination of circuits will be affected. For this purpose four main circuit wires are taken, preferably of different colors, and designated the "2," "5," "4" and "3" wire respectively. All are first carried to the bull's-eye together. Here a key or circuit-breaker is arranged (Fig. 2) so that whenever this plate is struck all four circuits are simultaneously opened and the figures 2543 in the four-drop annunciator at the firing point are all displayed at once and are read in the usual way from left to right.

The four circuits are then taken around the "four" ring and at each of its plates one of the circuits is omitted, the key being arranged in each case to break the remaining three. Hence a different combination or set of three circuits at each plate of the four rings is obtained. In like manner at each of the remaining plates of the target, keys are arranged to operate the particular arrangement or combination of circuits that corresponds to its particular number. The system is, therefore, comparatively simple. At the firing point the four main circuit wires are connected to the magnet coils of an ordinary four-drop an

nunciator having drops numbered 2, 5, 4 and 3, one controlled by each wire circuit. From the annunciator the four wires go to the battery in parallel arc and thence to ground; and from the target they go also to the ground; while at each firing point the wires running down the pole make a loop in which the annunciator may be temporarily inserted.

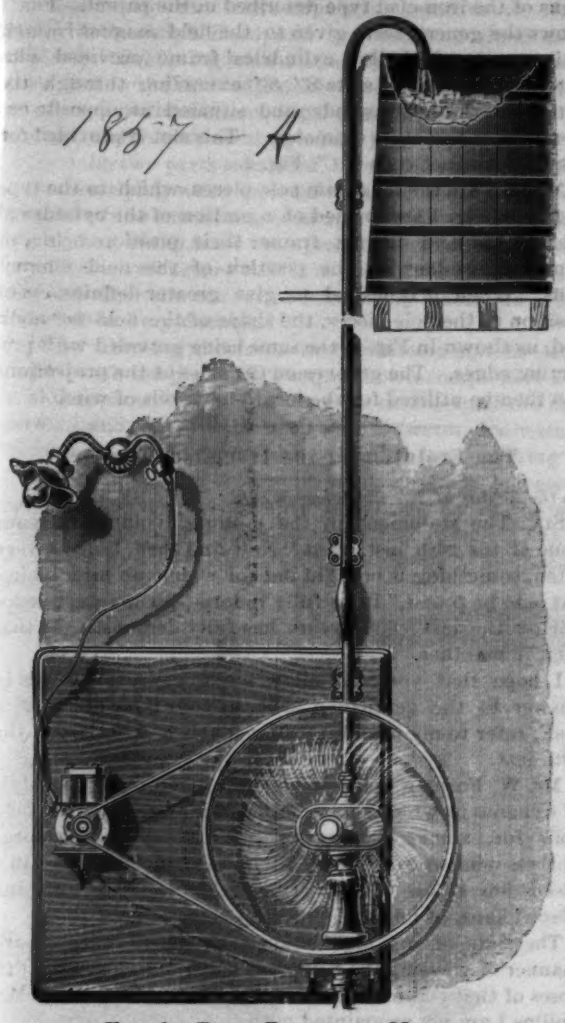


FIG. 6.—PUMP DRIVEN BY MOTOR.

Over the annunciator a miniature target, sub-divided and numbered like the distant one, serves to show at a glance the meaning of any indication and the location of the hit, although with little shooting the entire system becomes fixed in the memory. Thus, four figures or drops show a bull's-eye; three figures or drops show a "four" ring; less than three figures ending in 3 a "three" ring; with all other indications, a two ring is scored.

There are numerous features of detail in which the target differs from earlier forms, but it is a peculiar feature of this target that the different plates are arranged in receding planes from the periphery toward the centre, the bull's-eye being the rearmost plate. The great advantage of this arrangement will be apparent when it is considered that it admits placing the four corner plates of the target all in the same vertical plane to the front. When an ordinary paper target is pasted over the entire structure it presents, at any distance, the ordinary appearance of the service target, and is thus made absolutely free from the objectionable shadows that would otherwise be cast by the front plates upon those in the rear.

During the past summer the target described has undergone some tests in the hands of the inventor and has given good results. The comparative simplicity and cheapness of the device commends it favorably to all who are interested in target practice, as it promises a ready means of obtaining a reliable score delivered instantly at the firing point without labor of any kind, all intermediaries between marksman and target being wholly discarded.

The C. & C. Motor Company at the Electrical Exhibition.

The C. & C. Motor Company, who occupy a large space on the south side of the music stand, at the American Institute Electrical Exhibition, make one of the finest exhibits in the building. They show electric motors and batteries applied to a very large variety of uses; but as it is impossible in any limited space to show everything that can be done with the motor or battery, their idea has been to illustrate motors in use for widely different purposes, so that the exhibits will be rather sign posts of the possibilities, than complete demonstrations of everything to which the motor is applicable. The most conspicuous exhibit in their space, and one that is principally interesting to the ladies, is a portion of a sewing machine factory operated by a single one horse-power automatic motor, driven by the same current which supplies the lights for the operators.

This motor, illustrated in Fig. 1, is shunt-wound, so that it runs at a constant speed, whether running free or heavily loaded, and it is belted to a light shaft which runs lengthwise under the sewing tables. The operation and speed of each sewing machine is controlled by an individual treadle, which throws the belt of that machine into, or out of, connection with the main shaft by a friction clutch. This arrangement gives to each machine the full advantage of the whole power of the main shaft to start up quickly, so that a great deal of working time is saved by the operator being able to have her machine started instantly at full speed. Though the load occasionally put upon the motor, when all the sewing machines happen to be in operation at once, is considerably in excess of the rated capacity of the motor, and though again at times none of the machines are in operation and the motor is consequently running on "no load," its speed never varies more than 100 or 200 revolutions from its normal speed of 1,800.

Small Fan Outfit.

To show the convenience with which small electric motors can be handled, a number of the smallest sized motors are shown operating small propeller fans. The fan, which is made to be mounted directly upon the shaft of these motors, has its blades placed at a very slight angle, so that it can revolve at the highest speed of the motor, thus avoiding belting or gearing, without "churning" the air excessively. To give the necessary clearance to swing the fan, the motor is inverted so as to raise the shaft from the base and is mounted upon an ornamental tripod, which serves as a yoke to the field magnets. Upon the top is a lamp socket with a key, which serves as a switch for starting and stopping the fan, and furnishes a means of regulating the speed by putting in a plug, or putting in a lamp to increase the resistance in series with the motor.

Electric Boats.

The use of electric motors for marine propulsion is shown in a very handsome canoe made by Rushton & Co., the celebrated boat builders, especially for use with the C. & C. motor. A motor of the kind shown in Fig. 2 is placed in the stern of the boat. Its shaft is lengthened and extended out astern under the rudder, where a very small two-blade propeller, made to revolve at a very high speed, is mounted directly upon it. It is found better to use the propeller, which suffers some inefficiency from high speed, than to make the apparatus complicated by the introduction of gearing or belting to slow it down, and suffer the accompanying loss of 15 or 20 per cent. by extra friction. The current for actuating the motor is derived from four cells of Julien battery placed in a knee case in the centre of the boat, and the flow of current from the battery to the motor is controlled economically by a suitable switch, which is made as part of the motor. The apparatus on exhibition has a record of four miles an hour, carrying two passengers, on the Grass River near Canton, N. Y. While this is of course a very slow speed, the motor is altogether out of proportion to the boat, and it will readily be seen that when a ½ h. p. motor is substituted, as is the intention, a very high speed will be realized. The success of the apparatus has been so great that the builders are preparing to manufacture a full line of electric boats.

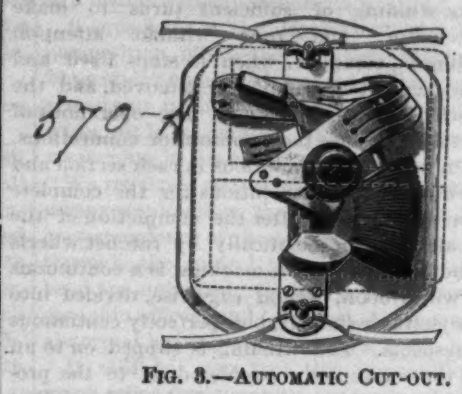


FIG. 3.—AUTOMATIC CUT-OUT.

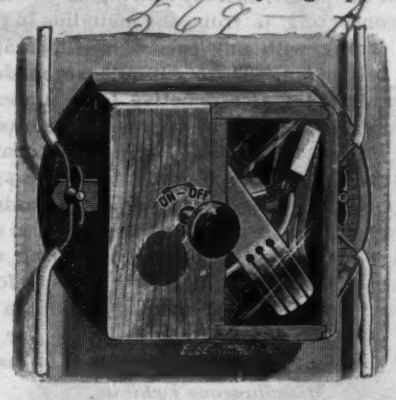


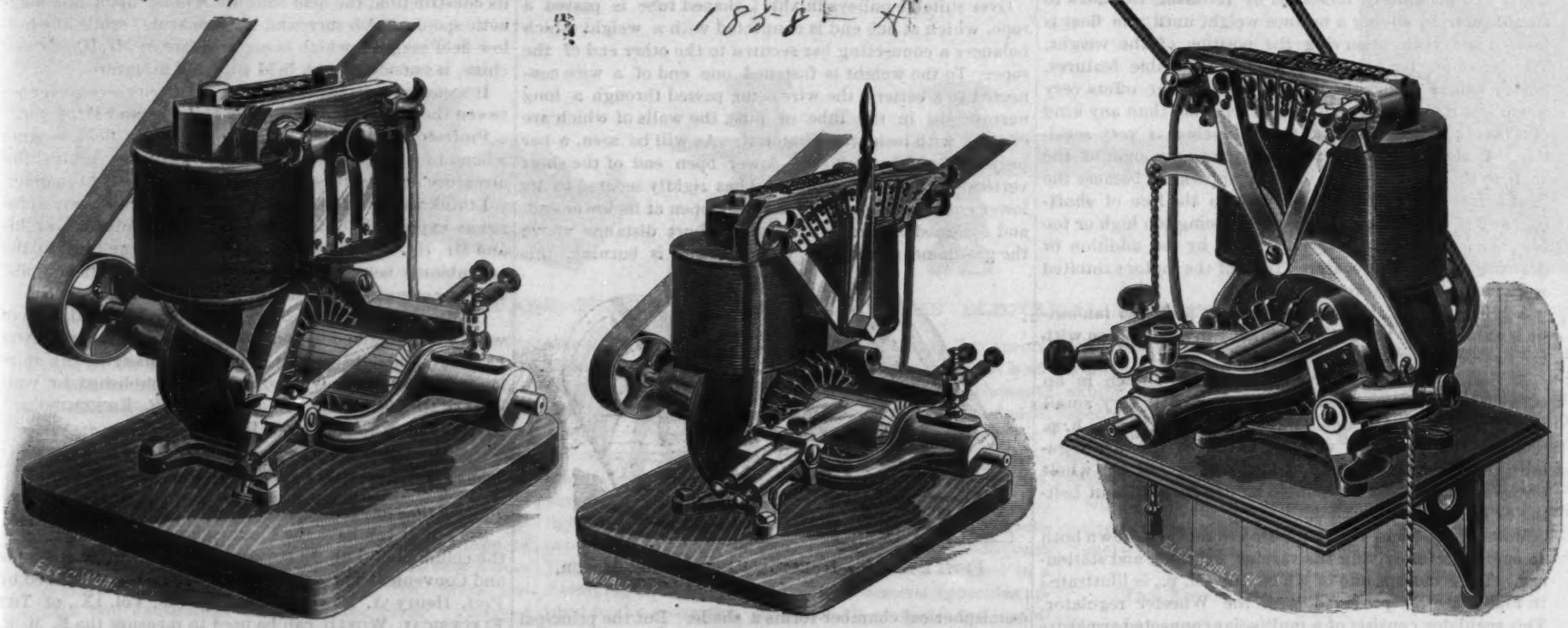
FIG. 4.—AUTOMATIC CUT-OUT.

Organ Pumps.

In response to a great many demands for motors to pump for organs a number have been arranged for this work, and one is shown at the exhibition pumping a large model of a Roosevelt electric-action church organ. Owing to the small amount of power required for this work, it has not been necessary to turn the power-switch on the motor further than the second contact out of five contacts, although the motor is of the smallest size made. The connecting gear between the motor and the bellows of this organ is the same as has been used in a number of other cases with entire success. It consists of a large bellows, which is driven by a belt from the small pulley of the motor, and which, in turning, imparts a reciprocating motion to a connecting rod, which is fastened to the pump handle of the organ.

The Automatic Armature Winding Machine.

This illustrates the practice of automatic and interchangeable machine work followed in the manufac-



FIGS. 1, 5 AND 2.—C. & C. MOTORS AT THE ELECTRICAL EXHIBITION.

ture of the C. & C. apparatus. It was designed with a view to working an automatic machine, which would wind a complete armature of such a nature that no connection between sections would be necessary, and that the work of assembling could be done by unskilled hands. This machine, which has already been described in our columns, winds insulated copper ribbon on edge, forming a complete armature winding of sufficient turns to make an efficient motor, and runs without attention until the winding is complete, when it stops itself and waits until the completed winding is removed, and the machine is started on a new winding. The operations of leaving projecting loops for the commutator connections, counting the number of convolutions in each section and counting the number of convolutions for the complete armature, so as to stop itself after the completion of the last turn, are all done automatically by ratchet wheels and cams. The product of the machine is a continuous flat bobbin of wire ribbon, wound edgewise, divided into sections by projecting windings, but perfectly continuous in all other respects. This winding is slipped on to an iron core, and the commutator is soldered on to the projecting loops, forming the armature. It is claimed that this is the only entirely automatic winding machine in existence. Its present aggregate product is a little over 1,000 armatures.

The Automatic Cut-out.

This apparatus, shown in Figs. 3 and 4, is furnished as an additional safeguard in places where a motor is to be run continuously on such work as fans, pumps, etc., where it may not receive much looking after. It is arranged to short circuit the motor, thereby slowing it down instantly, and disconnecting it from the main line in case anything goes wrong with any part of the apparatus, with the motor, belt or fan. These cut-outs are made so as to close the circuit if the electromotive force across the terminals of the motor exceeds the amount allowed. This covers any accidental opening of any circuit connections, the disarrangement of the brushes or too great speeding up of the motor, as in the case of the belt breaking. The cut-outs are sometimes wound and arranged so that they will not allow the motor to operate excepting upon the maintenance of given conditions of running—for example, when the armature and field are taking a specified amount of current and no other, or when the motor is running at 1,500 revolutions and no slower or faster.

Miscellaneous Exhibits.

A dynamometer of the form described in THE ELECTRICAL WORLD of Sept. 10 and 17 has been constructed by the inventor, Prof. J. Burkitt Webb, and is shown at the American Institute Exhibition in continuous operation with a C. & C. motor. The principle of the dynamometer is to observe the pull or torque exerted by a motor by mounting it upon a float or caisson in water and observing the extent to which the action of the motor, when doing work, tilts the float over sidewise. This is most conveniently and accurately measured by restoring the float to equilibrium by sliding a balance weight until the float is leveled and then observing the position of the weight. The dynamometer has several specially valuable features, among others being the fact that the water offers very much less resistance to shifting of position than any kind of a pivot; in other words, the balancing is very sensitive. It also overcomes the difficulty of alignment of the shaft to the motor and the driving apparatus, because the float is free to adjust itself sidewise to the line of shafting, and if out of line by reason of being too high or too low, the difficulty is easily remedied by the addition or drawing off of a little water. Tests of the motor exhibited were made at the Stevens Institute.

A ½ h. p. C. & C. motor and 18-inch propeller fan outfit is exhibited by the Julien Company in conjunction with their system of storage batteries.

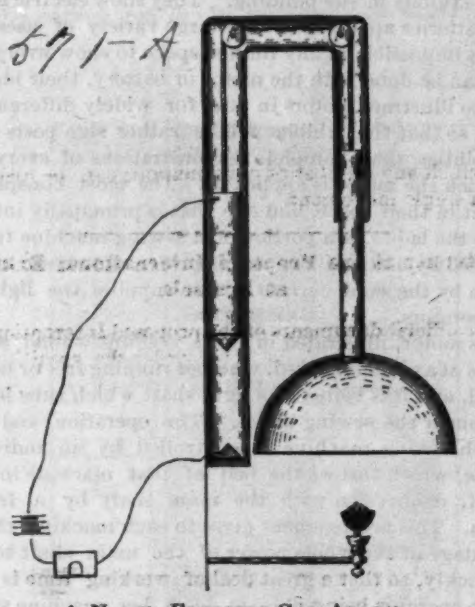
A simple method of driving blowers is shown in an efficient working apparatus, consisting of a very small Sturtevant blower, coupled direct to the shaft of a ½ h. p. motor. The speed and working of the blower are regulated by the speed-switch of the motor, and the whole forms a neat apparatus mounted on one base without belting or gearing of any kind.

Motors of ⅛, ¼ and 1 h. p. for arc circuits are shown both in operation for driving the various exhibits, and stationary. These motors, one of which, the ¼ h. p., is illustrated in Fig. 5, are all provided with the Wheeler regulator. This regulator consists of a multipolar connected armature and field, the field being wound in sections, which are proportioned so that they will divide the main line current with the armature, always taking that percentage which will give the most efficient output for the machine afforded by the condition of running, as determined by the speed switch. This switch is connected so as to be simply the means of short circuiting more or less of the coils of the field. In this way the current flowing through the armature is also controlled, without having actual access to the armature. The paths for the current of the arc light circuit between binding post and binding post of the motor are through the brushes and armature, through the coils of the field, and through the short circuiting switch and the coils of the field which are not short circuited. There are thus three paths for the current, and there is absolutely no danger of injury from the accidental opening of either one of these paths.

The small ¼ h. p. motor, shown in Fig. 2, is interesting as being made with a complete regulator. A further advance has been gained in this smallest machine by fitting it with a cylindrical commutator in all respects like those used on larger sizes. The armature core is supported by brass spiders into which the shaft is screwed, overcoming the difficulty of an unbalanced armature, and producing a perfectly interchangeable machine in motors to be used continuously on power lines. The bearings also are made heavier.

There is also shown in operation a rotary pump driven by a small C. & C. motor, and illustrated in Fig. 6. The motor is connected to the pump by a belt and furnishes a steady stream of water.

The show case within the exhibit contains the various interchangeable parts used in the making of motors as they come from the punches and tools before assembling. The parts are numerous, and many of them are of great novelty of detail. They indicate fine workmanship and high finish, and show clearly the uniformity not only obtainable, but one may say almost unavoidable, in manufacturing large quantities of apparatus.

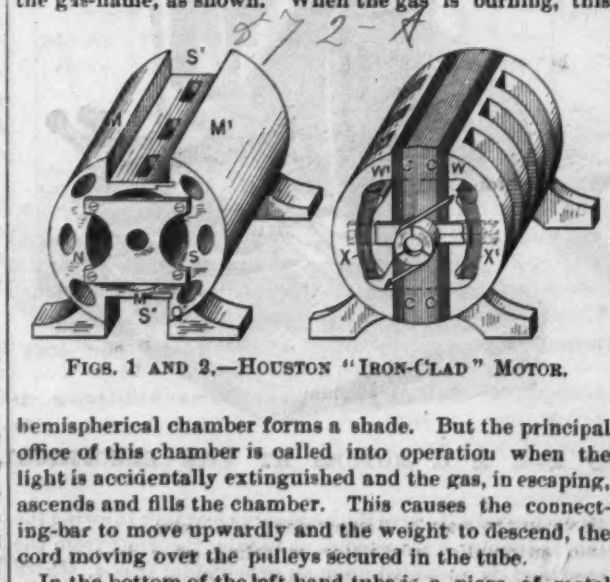


A NOVEL ELECTRIC GAS ALARM.

A Novel Electric Gas Alarm.

Our illustration represents an apparatus which has been designed to avoid accidents caused by the escape of gas from burners. It gives an alarm when a burner is accidentally turned on. To accomplish this object the inventor, Mr. Wm. G. Joerke, of this city, employs an inverted L-shaped pipe, one end of which is in line with the burner.

Over suitable pulleys in this L-shaped tube is passed a rope, which at one end is connected with a weight which balances a connecting bar secured to the other end of the rope. To the weight is fastened one end of a wire connected to a battery, the wire being passed through a long narrow slit in the tube or pipe, the walls of which are covered with insulating material. As will be seen, a bar projects out through the lower open end of the short vertical portion of the tube, and has rigidly secured to its lower end a hemispherical chamber, open at its lower end, and designed to occupy a position a short distance above the gas-flame, as shown. When the gas is burning, this



FIGS. 1 AND 2.—HOUSTON "IRON-CLAD" MOTOR.

hemispherical chamber forms a shade. But the principal office of this chamber is called into operation when the light is accidentally extinguished and the gas, in escaping, ascends and fills the chamber. This causes the connecting-bar to move upwardly and the weight to descend, the cord moving over the pulleys secured in the tube.

In the bottom of the left-hand tube is a piece of metal which constitutes the other terminal of the annunciator circuit. Hence when the weight descends into contact with the latter, the circuit is closed, and the alarm is given by the falling of the annunciator drop or the ringing of a bell.

Water-Wheels for Lighting Plants.—The Dustin & Hubbard Manufacturing Company, recently established at Oakland, Me., are about to increase their foundry capacity and otherwise add to their works. Overhead tramways are being put in and new machinery added. Among the orders now under way are water-wheels and machinery for an electric light plant at Waterville, and a similar outfit for Oakland.—*Iron Age.*

Houston's "Iron-Clad" Motor.

In a communication which appeared in our last issue, Prof. Edwin J. Houston took exception to a statement of Mr. Rudolph Eickemeyer as to priority in inclosing the armature in the field coils of a dynamo, and referred to a patent granted to himself, in which the armature is thus inclosed. Our illustrations, Figs. 1 and 2, show two designs of the iron-clad type described in the patent. Fig. 1 shows the general form given to the field magnet frames. This consists of a hollow cylindrical frame provided with exterior longitudinal slots *S'' S'* extending through the entire length of the cylinder and situated at opposite extremities of one of its diameters. This slot is provided for the field magnet coils *C C'*, Fig. 2.

N and *S* are the magnetic pole pieces, which in the type shown in Fig. 1 are formed of a portion of the cylindrical mass of the field magnet frame; their position being, of course, dependent on the position of the field magnet coils. When it is desired to give greater definiteness of position to the pole pieces, the shape of the field is modified, as shown in Fig. 2, the same being provided with projecting edges. The grooves on the sides of the projections can then be utilized for the location of coils of wire.

The Evolution of the Iron-Clad Dynamo.

To the Editor of The Electrical World:

SIR: The statement in the editorial column of your issue of the 26th inst., that "Now and then, but not very often, something is brought out for which no prior claimant is to be found," I can fully indorse, for my experience during the last thirty years has fully demonstrated that fact, if no other.

I hope that you will allow me to say a few words in answer to the gentlemen who, in your issue of the 20th inst., refer to my communication published in that of the 19th inst.

Mr. W. Forman Collins claims the invention of that style of dynamo in which the armature is inclosed in the field coils for, among others, his countryman Prof. George Forbes, who on Nov. 25, 1886, disclosed such a device in a discussion before the Society of Telegraph Engineers and Electricians, of London.

The date of my application for a patent on the above manner of winding the field coils being March 2, 1885, disposes of that claim. The other machine mentioned by Mr. Collins I am not acquainted with.

Prof. Edwin J. Houston, with whose work as an electrician I have been familiar for a long time, and of whose ability I have the highest opinion, says, in your issue of the 26th inst.: "On reference to a patent granted to me for an electric motor numbered 356,878, and dated Feb. 1, 1887, it will be seen that my field coils are not unlike Mr. Hyer's." In the patent here referred to, the field coils are wound upon a hollow cylindrical magnet which surrounds the armature, while in the Hyer motor, if I understand its construction, the field coils are wound upon non-magnetic spools which surround the armature, while the hollow field magnet, which is made square in Mr. Hyer's machine, is outside of both field wire and armature.

It seems to me that there is no similarity whatever between the field coils of Professor Houston and Mr. Hyer.

Professor Houston's patent discloses a field magnet wound in a peculiar manner, while in my machine the armature core itself becomes the core of the field magnet.

I think that Professor Houston will concur in my opinion as expressed above, both as to the resemblance of his and Mr. Hyer's style of winding the field, and as to the resemblance between his field coils and my field coils, when he examines the matter a little more closely.

Of Mr. Hyer's motor I have no other knowledge than what was contained in your issue of the 12th inst. And I yet am unable to see any reasons for changing my opinion as expressed in my communication published in your issue of the 19th inst. R. EICKEMEYER.

YONKERS, N. Y., Nov. 26, 1887.

Electromotive Force of the Water Battery.

To the Editor of The Electrical World:

SIR: Will you have the kindness to inform me, through the columns of THE ELECTRICAL WORLD, if the "Simple and Convenient Form of Water Battery," as described by Prof. Henry A. Rowland, on page 200, Vol. IX., of THE ELECTRICAL WORLD, can be used to measure the E. M. F. or difference of potential between two points in a circuit, or the relative difference between several points, and also what the probable E. M. F. of one cell of such a water battery is? FRANK SHLAUDEMAN.

DECATUR, Ill.

ANSWER: The battery can be used for the purpose designated. Regarding the E. M. F. of the zinc-copper-water battery, an able electrician gives us the following results of his tests:

"Zinc (amalgamated) and copper (clean) in pure water (zinc, copper and water all commercial) gives a slightly variable E. M. F. having a mean value of about 1.03 volts. Rods of zinc and copper each $\frac{3}{8}$ inch in diameter and ¾ inch long in a beaker of 1¼ inch diameter (about ¼ inch between electrodes), gave about 1 volt with pure water. The resistance was 30,000 ohms; 4 or 5 drops of sulphuric acid did not change the E. M. F. practically, but lowered the resistance to 250 ohms."—EDS. E. W.

The Wilson & Hard New Medical Apparatus.

At the American Institute Electrical Exhibition Messrs. Wilson & Hard of this city exhibit a most interesting set of electro-medical apparatus, which embody a number of novel improvements in the detail of construction, and by which the handling of the apparatus is greatly facilitated. These improvements are largely the result of the labor of Mr. J. Randolph Hard, and a number of them deserve notice. Beginning with a seemingly unimportant detail, we find in the new adjustable cord tip a novel combination. Our illustrations, Figs. 1 and 2, show the tip complete, and in part section, while Fig. 3 shows the same with the two parts separated. As will be seen in Fig. 2 the taper plug when screwed into the socket presses the tinsel of the connecting cord apart, making a good contact, and at the same time pressing it firmly against the wall of its socket, so that it is impossible to pull it out. This connection can be made in a very short time, and is said to be very durable.

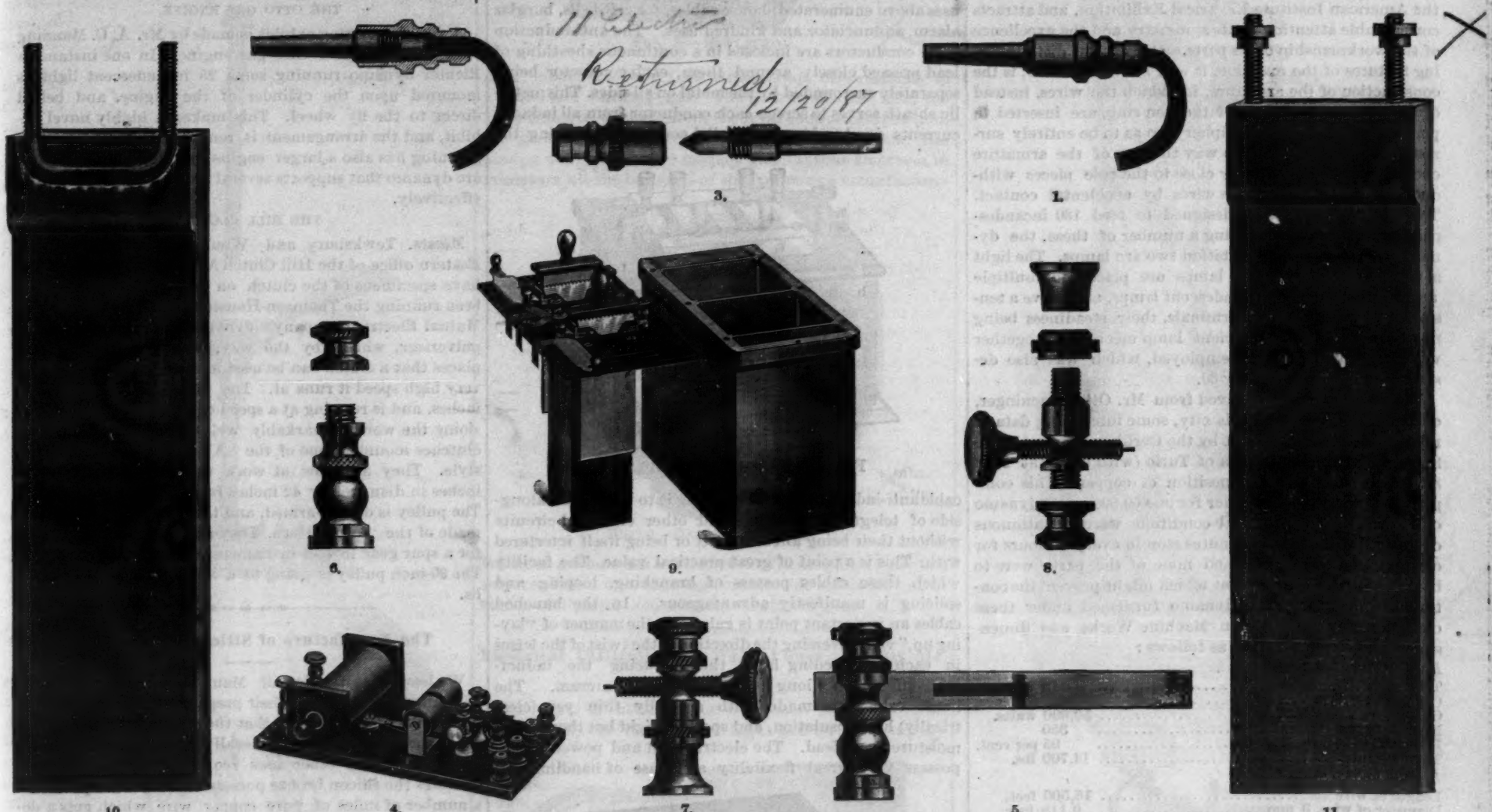
The vibrating rheotome and induction coil, in connection with the physician's set, is shown complete in Fig. 4. This apparatus is designed to give various qualities of current, and, as will be seen, the vibrator includes two electro-magnets, by means of which the vibrating reed can be started immediately without being operated by hand, each magnet working independently of the other. This instrument embraces several novelties. The first consists in a new form of vibrating reed by means of which the number of vibrations per second, as well as the quality of the current, can be regulated at will.

It will be noted that the reed, which is set in vibration, plays between two contacts, one on either side. The reed itself, shown in Fig. 5, is held in a slotted post, shown in detail in Fig. 6. For a slow vibration the spring is placed so that its extreme end is even with the rear of the post so as to give a long swing to the reed; whereas for a rapid vibration the reed is pushed into the slot as far as is admissible. The reed itself is made of a single piece of metal into which a strip of platinum is set, so that it does not interfere with the conductivity of the spring, and makes one continuous surface of the whole. This reed vibrates between two contact posts, shown complete and in detail in Figs. 7 and 8. These posts are so constructed that the contact point can be placed at any angle with relation to the reed, so that the point of contact can be changed at will, and in this manner the number of vibrations of the reed can also be controlled, to a certain extent, by shortening or lengthening the swing of the reed.

The battery cells employed in connection with this apparatus contain a number of improvements. Our illustrations, Fig. 9, shows the double cell with the cover and electrodes removed, showing the entire construction. The cell as well as the cover are made of hard rubber, and at each end it has a special compartment, designed as a drip cup, into which the zincs are inserted after they are pulled out of the liquid when the battery is not in use. On the cover of the cell is a frame, on the upper edge of which are hinged a pair of serrated plates, one for each zinc, which bear against the faces of the latter when they are inserted in the liquid, as shown in Fig. 9. These serrated plates serve to hold the zinc in the frame, and their numerous points serve to insure good contact. The plates are provided with springs, which press them against the zincs, and are provided with thumb pieces, so that they can be held apart for the insertion of the zincs. Underneath the zinc holder is a plate provided with a packing strip of soft rubber. As the zinc is withdrawn this soft rubber wipes off the acid adhering to the zinc, and the latter being placed in the drip cup provided at the side, any remaining acid falls to the bottom.

The double cell is also provided with a nut for throwing into circuit one or both cells as desired.

The carbon used in the cell is molded together with the connector, as shown in Figs. 10 and 11, so that all corrosion of the connector is obviated. This is accomplished by soaking the upper part of the carbon in melted paraffine, so that the paraffine fills the pores and prevents the liquid from rising in contact with the connector. Messrs. Wilson & Hard also exhibit a beautiful physician's cabinet, fully equipped, and containing a multiple switch, by which any number of combinations can be made with but a single movement.



WILSON & HARD MEDICAL APPARATUS AT THE ELECTRICAL EXHIBITION.

Electricity at the Proposed International Exhibition at Brussels.

The official documents of the proposed International Exhibition at Brussels, to be given under the special patronage of King Leopold of Belgium in 1888 have just been issued. The exhibition is of a general nature, but special attention is to be paid to electricity. An appeal is addressed to electricians to participate, and an elaborate classification is made of electrical apparatus to be included. The list includes apparatus for "the blowing of mines" as well as the best methods for the "inflammation of caps at high tension, at an average tension, and at low tension." One item is a "process of electrical lighting of sail ships," and another is "the most practical process to set fire to artillery pieces." In subdivision E is included the best electric battery to be used in a "telegraphic flying station"; also "electric apparatus applied to the realization of the block system," and "communications of stationary posts with the walking posts and of the latter between them"; besides "apparatus of electric correspondence between the station employés and those on the way." Department 60*a* relates to systems "of automatic informator revealing at a distance the temperature of certain places in a monument or any establishment." The item of "beat recorder" in class 61 may possibly be taken to refer to apparatus for counting deadheads. In section 58 is classed the best accumulator, among whose good points are enumerated "maximum coefficient of restitution in ampère hours" and least "deformation of the blades."

Several important points come under consideration in the class of electric lighting. Section 50 includes the "best support of electric lamps for public lighting." We are of the opinion that 70 cents a night would meet this case. The carbon companies will be interested in showing their Belgian brethren the "best electric pencils for arc-focuses."

Subdivision 47*a* includes "the best arrangement to appreciate the value of an electric battery." Perhaps some of the new primary battery stock operators in England will win in that competition. The next section includes "the best light machine of a power superior to 10,000 watts," as well as "the best system of transferring to a distance some mechanical energy."

It is perhaps in the department of telephony that the competition offers the greatest problems for solution. Thus under clause 39 is wanted "The best practical system remedying to the mutual telephonic induction of single wires, set in a parallel manner, without any noticeable weakening in the vocal reception." The committee add: "We require a system which by the most simple and sure means would allow the intercourse of the posts and the correspondence of these posts with the others of the net through the central office." Under the same general head are embraced "the best commutator of wires for telegraphic offices" and "the best arrangement to present to abnormal heating of conductors."

It will be seen that this unusual competition gives much scope for ingenuity, but under the head of "annexed question" it is provided that "a reward shall be granted to the most remarkable invention in the electric domain not forseen in the questions propounded in the competition."

The prizes offered are tempting. The first prize, additional to special awards in money, etc., is a "diploma of gold medal with gilt medal." There is also a "diploma of stimulation" and a diploma of "participation, with a commemorative medal, is given to all adherers to this exhibition." Any electricians who desire to take part should be prompt, as "the price of sites of the tariff of the general regulations will be doubled for tardy applications." On "applicating" to Armstrong, Knauer & Co., 823–824 Broadway, any wishful of obtaining information "will receive gratuitously all documents and desiderata concerning especially his industry." The firm will supply "every information."

The New York Telephone Investigation.

To the Editor of The Electrical World:

SIR: The special Assembly Committee investigating telephone companies will resume its sessions in New York City, at the Coal and Iron Exchange, Cortlandt and Church streets, at 10.30 A. M., Wednesday, Dec. 7. The companies whose operations will be investigated are: The Metropolitan Telephone Company, whose territory embraces the city of New York; the New York & New Jersey Telephone Company, operating Long Island and New Jersey, within 33 miles of the City Hall, New York, excepting Newark; the American Telephone and Telegraph Company, engaged in the construction of long-distance telephone lines east, west and south from New York City.

WM. H. WEED, Clerk of Committee.

MEXICO, N. Y., Nov. 26, 1887.

Train Lighting in Canada.—The Montreal *Herald* of Nov. 5 speaks highly of the lighting of the Pullman cars on the Canada Atlantic road with incandescent lamps using the Julien storage batteries.

Marshall's Condensers at the Electrical Exhibition.

The exhibit of condensers made at the electrical exhibition by Mr. Wm. Marshall contains a large variety of instruments adapted to different situations. Among them are the new condensers recently described in our columns, the plates of which can be combined to give a large range of capacities, by the employment of plug switches, permitting the connection of the plates in parallel or series as desired. The exhibit also contains the usual standard types of condenser, illustrated in Figs. 1, 2 and 3, as well as several varieties adapted for telegraphic work. There is also shown a small pocket condenser of .025 microfarad, suitable for testing and other purposes. It is cylindrical in shape, as shown in Fig. 4; another one, specially constructed for telephone work, Fig. 5, of .028 microfarads, is designed as a shunt to the magnets of call-bells, so as to reduce the retardation due to the magnets. The condenser is assuming more importance day by day in electrical work, and the exhibit of Mr. Marshall is well calculated to show the uses to which the condenser can be put.

Notes of the American Institute Electrical Exhibition.

We continue below our notes on the American Institute exhibits:

THE OERLIKON DYNAMO.

The Oerlikon dynamo, designed by Mr. C. E. L. Brown and described in our issue of July 23 last, is exhibited at the American Institute Electrical Exhibition, and attracts considerable attention by its symmetry and the excellence of the workmanship of its parts. One of the distinguishing features of the machine, it will be remembered, is the construction of the armature, in which the wires, instead of lying on the surface of the iron ring, are inserted in perforations near the periphery, so as to be entirely surrounded by metal. In this way the iron of the armature can be brought exceedingly close to the pole pieces without danger of stripping the wires by accidental contact. The machine exhibited is designed to feed 130 incandescent lamps. Besides running a number of these, the dynamo operates at the Exhibition two arc lamps. The light is white and steady. The lamps are placed in multiple arc, similar to the incandescent lamps, and have a tension of 70 volts at their terminals, their steadiness being no doubt due to the efficient lamp mechanism together with the Brown regulator employed, which was also described in our issue of July 30.

We have recently received from Mr. Otto Grueninger, consulting engineer of this city, some interesting data in relation to machines built by the Oerlikon Works for the Società Elettrometallurgica of Turin (with works at Port St. Martin) for electro-deposition of copper. This company originally gave an order for one 50,000-watts dynamo of 115 volts. The principal conditions were: Continuous operation with only 5 minutes stop in every 24 hours for cleaning and wiping off; and none of the parts were to heat in any way near a point which might prevent the continuous operation. The dynamo furnished under these conditions by the Oerlikon Machine Works was dimensioned and stood the tests, as follows:

Data of operation:	
Tension at terminals	115 volts.
Current	440 ampères.
Output	50,600 watts.
Number of revol. per min.	350
Electrical efficiency	95 per cent.
Total weight	14,700 lbs.
Field magnets, shunt:	
Length of wire	15,500 feet.
Diameter of wire, 3 mm	0.118 inch.
Sectional area of wire, 7.069 sq. mm	0.0109 sq. inch.
Resistance as connected	11.10 ohms.
Current in shunt	10.36 ampères.
Number of turns of wire	3,370
Ampère turns	34,913
Energy consumed in field	1,191.4 watts.
Current density per sq. mm. section	1.46 ampères.
Armature:	
Axial length	21.6 inches.
Diameter	23⅝ inches.
Total length of wire	476 feet.
Total weight of wire	223 lbs.
Sectional area, 78.54 sq. mm	0.122 sq. inch.
Resistance	0.0075 ohm.
Current density per sq. mm	2.8 ampères.
Energy consumed in armature	1,525 watts.

After 14 hours of continuous operation under full load, the temperatures were as follows: Armature, 140 degrees F.; field magnets, 86 degrees F.

This and the subsequent tests were so satisfactory that it led immediately to an order for four more of these same machines. These five machines have now been working at Port St. Martin for some time. They took the place of a number of dynamos which had been a constant source of trouble through excessive heating and burning out of armatures.

The excellent results which are being obtained in the transmission of power by Oerlikon dynamos at Solothurn, Switzerland, have now led to an order for transmitting at Lucerne 120 horse-power over a distance of nearly two miles. The Oerlikon Machine Works guarantee in this instance a commercial efficiency of the total plant of 75 per cent. There will be but one generator and one motor, each of 100,000 watts capacity.

THE STANDARD UNDERGROUND CABLE COMPANY.

Owing to the many objections to overhead wires, among which are their liability to injury or interruption by wind and rain, their danger, their obstruction of the streets and their unsightliness, the underground question is demanding and receiving considerable attention. The Waring insulation, which is used by the Standard Underground Cable Company, is a hydro-carbon compound of very low specific inductive capacity and the highest insulating quality. The insulation is uniform in quality throughout the length of the conductor, and ranges from 200 to 1,000 megohms as required. Its heat resisting point is extremely high, and it is no small advantage that cables, the conductors of which have been insulated with it, can with entire safety be laid in close proximity to steam heating pipes, the necessity for which so frequently arises in manufactories and along the streets.

FIGS. 1, 4 AND 5.—MARSHALL'S CONDENSERS.

The cables made by the company are: anti-induction cables, for telegraph, telephone and general electrical uses; bunched cables, for telegraph, telephone and general electrical uses; electric light and power cables, for arc and incandescent lighting and for power; submarine cables for any of the uses above enumerated; house cables, for call-bells, burglar alarm, annunciator and kindred uses. The anti-induction cable conductors are inclosed in a continuous sheathing of lead pressed closely around them, each conductor being separately surrounded by the metal on all sides. This metallic sheath serves to screen each conductor from all induced currents due to adjacent parallel conductors, making the

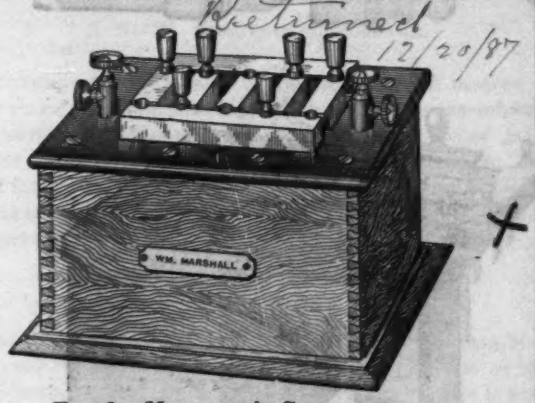


FIG. 2.—MARSHALL'S CONDENSER.

cable anti-inductional, and enabling it to be worked alongside of telegraph, telephone and other electrical circuits without their being affected by it or being itself interfered with. This is a point of great practical value. The facility which these cables possess of branching, looping and splicing is manifestly advantageous. In the bunched cables an important point is gained by the manner of "laying up," viz.: reversing the direction of the twist of the wires in each succeeding layer, thus reducing the inductive effect in long lines to a minimum. The house cables are made with specially thin yet (electrically) high insulation, and specially light but thoroughly moisture proof lead. The electric light and power cables possess very great flexibility and ease of handling and

FIG. 3.—MARSHALL'S CONDENSER.

bending. The company's submarine cables in addition to embodying the principles already referred to can be made with iron armor protection.

AMERICAN MANUFACTURING AND SUPPLY COMPANY'S (LIMITED) SELF-WINDING CLOCKS.

This company makes a show of self-winding clocks on an effective system. The usual winding part of the clock is dispensed with, and a fine motor is substituted, which is connected with the battery that is placed in every case. The motive power of the clock is a very fine spring, and it makes an automatic connection hourly and winds the spring, cutting itself out at the end of six or seven seconds, so that the spring is always at a uniform tension. There is no possibility of over winding, as the winding is always in the direction that the hands are moving in. Thus all checking and compensation are avoided, and the train can be shortened to such an extent as to reduce the friction most materially.

D. ROUSSEAU.

This exhibit specially illustrates the application of electricity to domestic uses. Various forms are here presented of burglar alarms, push-buttons, burners, automatic and otherwise; bells and annunciators. The push-buttons are as novel and pleasing in appearance as they must be satisfactory in practical operation. It is no slight convenience and comfort to be able to light or extinguish the gas at any point in the house by the touch of a push-button. The buttons are set in sheets of luminous cardboard so that they can be seen, and their special connections read in the dark. Even the gas pendant shines out of the darkness, and the tardy match-box will no longer vex the soul of the weary searcher. In response to the urgent request of some spirited representatives of the jeunesse dorée, Mr. Rousseau is at work on a *luminous latch keyhole*, which he has promised to have ready for the festive season now rapidly approaching. The extent to which the electric lighting of streets has caused a decrease in crime has of late been much commented on, and when in addition to this the burglar alarm will, on any attempt being made to enter a door or window, light the gas, sound an alarm and drop a tag showing the room entered, the midnight marauder must begin to realize that his occupation is gone. On a recent occasion a house was broken into. Though the man was a skilled thief the alarm was communicated to the nearest precinct, where the number of the house was indicated. Policemen were instantly dispatched, and in a very short time the burglar was in the lock-up. Inventions of this kind will be keenly appreciated. A new feature of Mr. Rousseau's watchman's clock is that by an ingenious arrangement any tampering or accidental interruption of current is provided against. The exhibit contains a fine Holtz static electric machine, with six 26-inch revolving plates. It gives a 13-inch spark, and by an improved device avoids all friction on the revolving plates.

THE OTTO GAS ENGINE.

A very interesting exhibit is made by Mr. A. C. Manning with the celebrated Otto gas engine. In one instance a Richter dynamo running some 25 incandescent lights is mounted upon the cylinder of the engine, and belted direct to the fly wheel. This makes a highly novel exhibit, and the arrangement is remarkably compact. Mr. Manning has also a larger engine running a Waterhouse arc dynamo that supports several arc lamps of that system effectively.

THE HILL CLUTCH.

Messrs. Tewksbury and Wonham, managers of the Eastern office of the Hill Clutch Works, of Cleveland, O., have specimens of the clutch on exhibition. They have been running the Thomson-Houston welding machine, the Mutual Electric Company's dynamo and the "cyclone" pulverizer, which, by the way, is one of the hardest places that a clutch can be used in owing to the dust and very high speed it runs at. The clutch is 24 inches by 9 inches, and is running at a speed of nearly 600 revolutions, doing the work remarkably well. They have also two clutches mounted, one of the "A" and one of the "B" style. They are now at work upon a clutch pulley 90 inches in diameter by 42 inches face to transmit 500 h. p. The pulley is double-armed, and the clutch has six arms made of the "A" pattern. They are also making a clutch for a spur gear 18 feet in diameter, and weighing 14 tons. The 90-inch pulley is going to a large mill in Minneapolis.

The Manufacture of Silicon Bronze Wire.

We learn that the Scovill Manufacturing Company, of Waterbury, are pushing their preparations for the production of silicon bronze, and that they mean to introduce it for purposes which now generally utilize pure copper as well as for those other uses requiring the high tensile qualities the silicon bronze possesses. They have produced a number of miles of pure copper wire which gets a decided increase of tensile strength by the introduction of a core of silicon bronze. Specimens of this wire give a resistance as low as six ohms to the mile for a wire .104 inch diameter, and the gain in tensile strength is something over ten per cent. over the best specimens of hard drawn copper. They are applying the same principle to the construction of a conductor having a resistance of one ohm to the mile; and the advantage in the wire of putting the strength in the middle and making a core which shall be strongly surrounded by a conductor of pure copper seems to be obtained in this form of compound wire without the drawbacks which the steel cores have shown in practice.

In the matter of homogeneous silicon bronze wires the company have already drawn specimens of wire showing a tensile strength of something over one hundred and thirty thousand pounds per square inch, and we have seen another specimen of silicon bronze which stood a twisting test of over one hundred turns in six inches. They have built on their grounds at Waterbury a laboratory, in charge of Dr. L. Waldo, which is fitted with the most approved forms of electrical and mechanical testing apparatus, and have given a careful consideration to the chemical and physical questions involved in the production of bronze conductors.

In pure silicon bronzes where no special effort is made to preserve the conductivity at the expense of tensile strength, the company furnish a wire .080 inch diameter, with a breaking strain a trifle over 650 pounds, and a resistance per mile of thirty-nine ohms. This would seem to be a most admirable wire for all kinds of long single span stretches, and the fact that it does not corrode, even as easily as pure copper, fits it for use in places exposed to the gases of manufacturing cities and salt air.

The Exhibit of the E. P. Gleason Manufacturing Company.

In Alcove 20, at the Electrical Exhibition, the E. P. Gleason Manufacturing Company make an interesting exhibit of sundry appliances for gas and electric illumination. The former do not particularly interest us, but we may briefly mention the so-called "pre-heating" beacon fixtures, wherein the gas is heated immediately before its consumption, so as to render the particles of carbon more brilliantly incandescent.

The various Gleason factories have sent specimens of their work, some of which are interesting. The glass works at Brooklyn have furnished the largest globe ever blown in this country, measuring, finished, 37 inches high and 28 inches diameter. The lump of molten glass weighed about 50 pounds on the end of the blow pipe. When we consider that one man's lungs and his strength were required to shape this mass and keep it hot to an incandescence in order to form it, we can better understand the value and rarity of so large a globe. The company also exhibit a fine line of rich cut, satin finish, tinted, blended and etched globes and shades of variform and fantastic shape, as well as plain or clear, ground or opal arc globes, and opal shades and globes. The flower-like shades on the lights around the fountain were furnished by this company.

The brass factories have contributed fittings, patent insulated joints, holders, brackets, plates, canopies, ornamental lanterns for combined gas and electric, patent clusters, etc., etc.

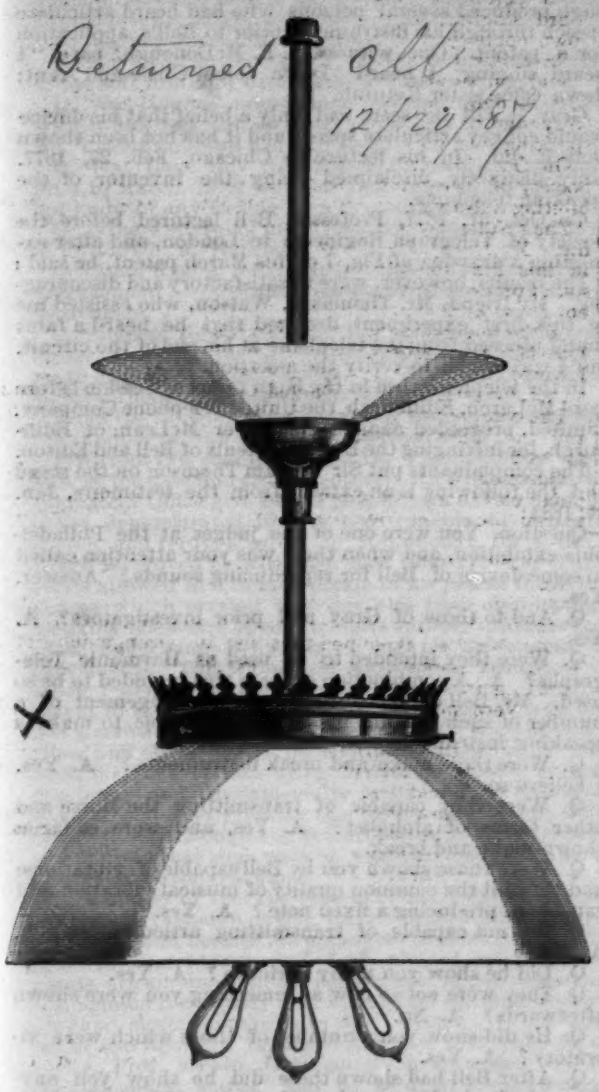


FIG. 2.—FOLDING CLUSTER.

The insulated patent joint shown in Fig. 1 is an improvement on those formerly in use, and although brought out only in July of this year, it has already been adopted quite extensively. Those used on the gas fixtures of the American Institute Fair and the samples exhibited prove it to be a strong, substantial joint. There is no insulation under the heads of the screws to be broken or strained by the weight of the fixture or by a sudden wrench; no danger threatens from twisting of the wire or fixture; absolute imperviousness to gas is secured, and there is no short circuiting across the joint in any ordinary uses.

The new "folding cluster" shown in Fig. 2 is a neat contrivance, supporting the incandescent lamps, either horizontally or vertically, and anywhere between these two points. There is also a sample of brackets furnished for Mr. Vanderbilt's yacht "Alva," and some reflecting lamps furnished the various United States dispatch boats, Figs. 3 and 4. The beacon reflector, a cheap but effective incandescent-lamp fixture, is also on exhibition. It displaces the reflectors in which sections of porcelain are used to reflect the rays. If the 14-inch shade is accidentally broken it can be replaced for 30 cents, the whole being so arranged that no rewiring or disturbing of fixture is necessary. It seems a good fixture for stores, factories and places where low first outlay and good light are main considerations.

The iron foundry of the company sends ceiling plates, etc., etc., and as a curiosity, some fittings from ⅛ to 8 inch pipe, male and female, just as taken from the sand, having the thread cast in. Many mechanical engineers and experts who examined these have expressed some doubts as to their being genuine, but when some of the core sand was removed from the bottoms of the thread, and a microscopic examination had, it was found that the scale, formed by contact with the sand, was unbroken, and that no cutting or lathe work had been done.

There is also in the exhibit what the ladies call a "cunning" model of a New York street lamp, made exactly to a scale, and burning gas. The post is of cast iron, the lamp frame of wrought iron, the lever cock of composition, the globe of glass, lettered with street names, and the canopy and reflector are made of tin. It thus embraces in miniature all the branches of the company's manufacture.

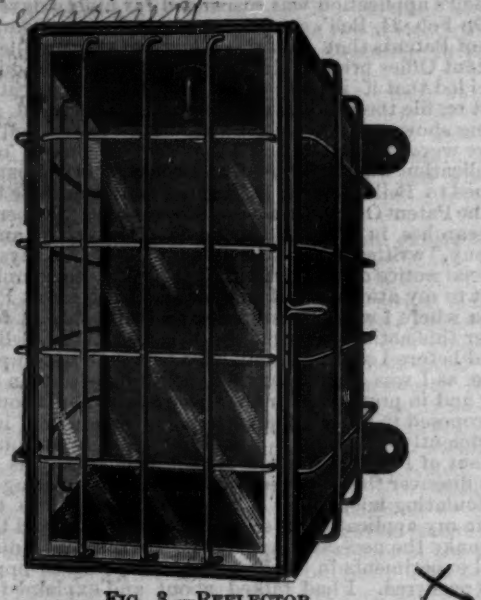


FIG. 3.—REFLECTOR.

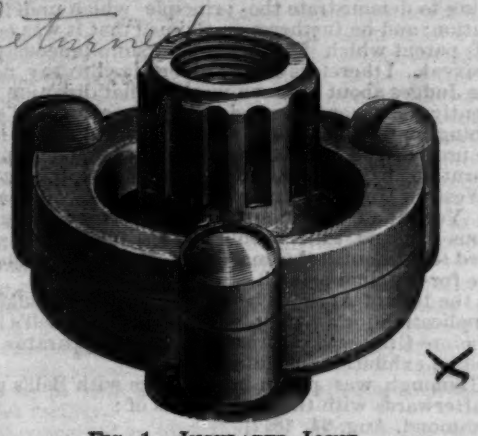


FIG. 1.—INSULATED JOINT.

Taken as a whole the exhibit of the Gleason Company is a very creditable one, showing considerable advancement in modes of illumination, whether electric or gas.

Electrical Utilization of Water-Power at Sault Ste. Marie.

The work of utilizing the fine water-power at Sault Ste. Marie by the Edison Sault Light and Power Company is being watched with great interest. Mr. B. B. Powell, the secretary and general manager of the company, writes us as follows on the subject;

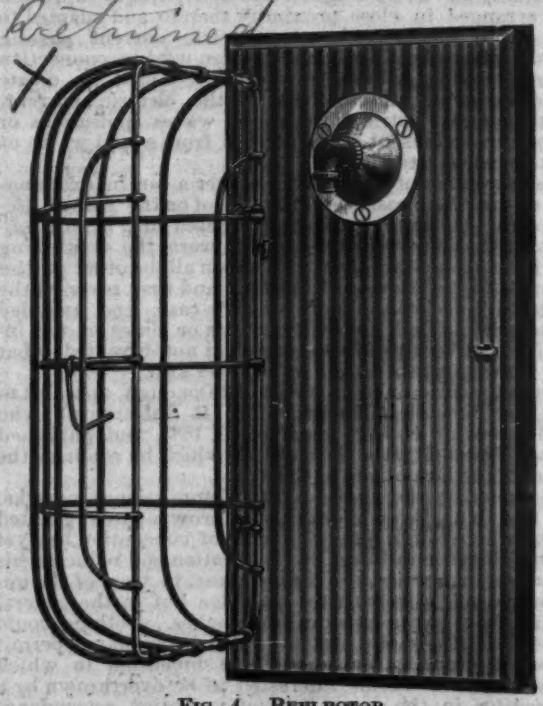
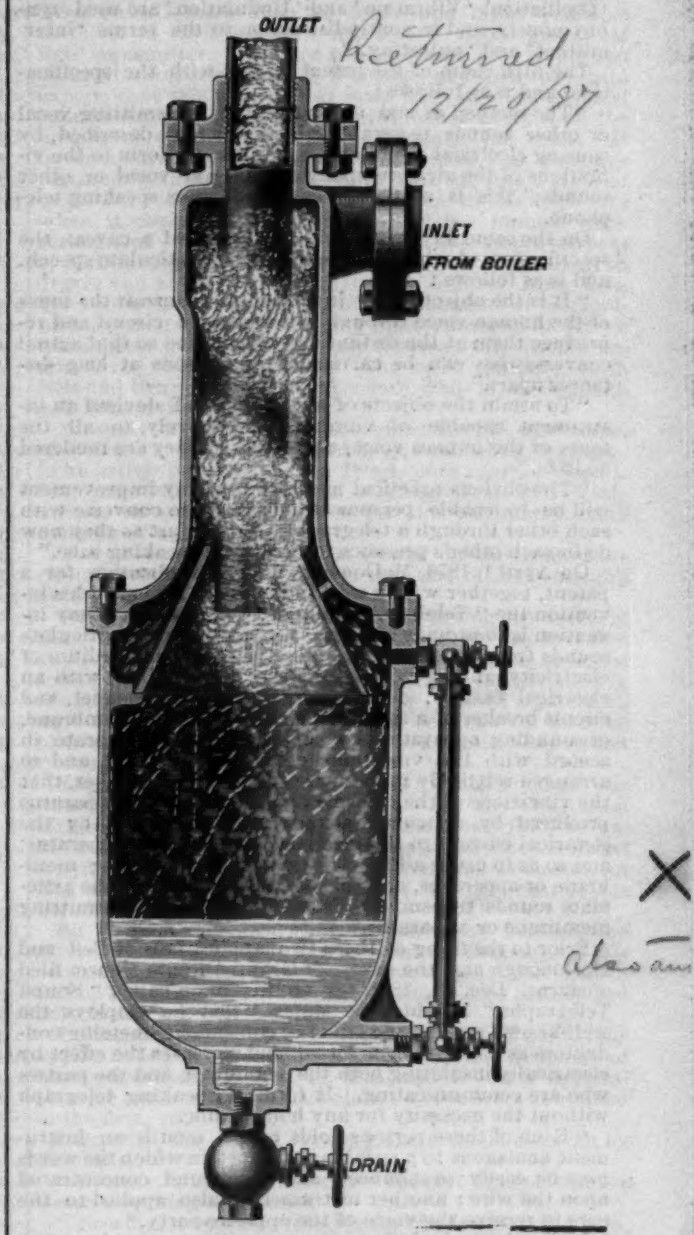


FIG. 4.—REFLECTOR.

"We are making a canal two thousand feet long to conduct the water for power to our station. The canal will be ready to let the water in about Dec. 10. We have our dam completed and pen stocks that will accomodate wheels to furnish eighteen hundred horse-power. We are building a stone station 60 by 74 feet, with concrete floor and truss roof for a dynamo room. This with asbestos roof will make nearly a fire-proof building. Our wheel house is 16 by 74 feet, placed at an angle of 60 degrees to admit of shafting so arranged that each pair of dynamos will be independent of the others. The water wheels to get started (two in number), pulleys, shafting, gearing, etc., have been shipped from Stilwell, Bierce & Co., of Dayton, Ohio. By Saturday night, Nov. 19, we expect to have the stone walls up and the roof on the building, and will probably be furnishing light and power by Dec. 15. This station is being built as much for the purpose of furnishing electric power as for light, and having Lake Superior with its 32,000 square miles of water to draw from, we consider it safe to make contracts to furnish either large or small powers regardless of dry weather."

The Stratton Separator at the Electrical Exhibition.

The evil effects of water in the cylinder of steam engines is well known. It causes not only a loss of efficiency but is frequently the source of accident to the engine. Numerous devices have been gotten up to remove the water from the steam before it arrives at the engine, and one of the most recent of these which has come into extensive use is the Stratton separator, built by the Stratton Separator Company, of this city.



THE STRATTON SEPARATOR.

The apparatus, which is shown in section in the accompanying engraving, consists of a vertical cylinder having an internal central pipe extending from the top downward, about one-half its height, which forms the outlet pipe. The steam enters tangentially to the annular space between the inner and outer pipe at the side near the top of the apparatus. The speed of the incoming current produces centrifugal action, causing the steam to pass in a spiral line around the internal pipe down to its lower end, where it abruptly changes its direction upward, passing through and out at the top to the point where the steam is to be used. The entrained water thus separated by the centrifugal force is thrown to the outside of the downward current and falls into the collecting chamber below, from whence it can be blown off by hand or automatically drawn by a pump or trap and returned to the boiler without loss of temperature. A glass gauge is attached to guard against an over-accumulation of water, and by which the amount of water taken out can be measured if desired.

We may add that separators of this type are employed at the American Institute Electrical Exhibition, also in Mr. Edison's new laboratory, at Orange, N. J.; on board the U. S. men-of-war "Trenton" and "Chicago," and in a large number of other places.

Lighting a Toboggan Slide.—A big toboggan slide is to be built at Fleetwood Park, near this city, and illuminated by 36 full 2,000 arc lights on a pole at least 175 feet high.

A Review of Certain Claims to the Art of Telephony.

BY F. W. JONES.

On Feb. 14, 1876, Bell applied for a patent for an improvement in telegraphy for sending several messages over the same wire by induced currents. Fig. 7 of this application is the device which has been the central point of all legal contests, and which, so far, the courts have placed in the way of the development and use of any other kind of speaking telephone in the United States. March 7, 1876, Bell received the patent, and in it the broad claim: "The method of producing undulations in a continuous voltaic circuit by gradually increasing and diminishing the resistance of the circuit, or by gradually increasing and diminishing the power of the battery."

In the specification, no allusion is made to transmitting articulate speech, but after describing his harmonic telegraph arrangement, he says, "I desire here to remark that there are many other uses to which these instruments may be put, such as the simultaneous transmission of musical notes, differing in loudness as well as in pitch, and the telegraphic transmission of noise, or sounds of any kind." After this he says: "One of the ways in which the armature *C*, Fig. 5, may be set in vibration has been stated above to be by wind. Another mode is shown in Fig. 7, whereby motion can be imparted to the armature by the human voice, or by means of a musical instrument." Bell also ends his specification by declaring that "In this specification the three words 'Oscillation' 'Vibration' and 'Undulation' are used synonymously, and in contradistinction to the terms 'intermittent' and 'pulsating.'"

The fifth claim of the patent agrees with the specification, and is as follows:

"The method of and apparatus for transmitting vocal or other sounds te egraphically as herein described, by causing electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds;" this is all there was to indicate a speaking telephone.

On the same day, viz., Feb. 14, Gray filed a caveat, the specification of which shows it to be for articulate speech, and is as follows:

"It is the object of my invention to transmit the tones of the human voice through a telegraphic circuit and reproduce them at the distant end of the line so that actual conversations can be carried on by persons at long distances apart."

"To attain the objects of my invention I devised an instrument capable of vibrating reponsively to all the tones of the human voice, and by which they are rendered audible."

"The obvious practical application of my improvement will be to enable persons at a distance to converse with each other through a telegraphic circuit just as they now do in each other's presence or through a speaking tube."

On April 1, 1876, McDonough filed an application for a patent, together with a working model. He called his invention the "Teleloge," and says: "The object of my invention is to provide a means for transmitting articulate sounds from one place to another, through the medium of electricity, and it consists in the combination with an electrical battery, circuit wires, armature, magnet, and circuit breaker of a transmitting and receiving membrane, or sounding apparatus, so constructed as to vibrate in accord with the vibrations of articulate sound, and so arranged relatively to the magnet and circuit breaker, that the vibrations of the transmitting membrane or apparatus produced by articulate sounds are transmitted by the electrical current to the receiving membrane or apparatus, and so as to cause a like vibration of the receiving membrane or apparatus, and to cause it to reproduce the articulate sounds transmitted from and by the transmitting membrane or apparatus."

Prior to the filing of these two applications of Bell and McDonough and the caveat of Gray, Antonio Meucci filed a caveat, Dec. 28, 1871, for an invention called "Sound Telegraphs," in which he states "that he employs the well-known conducting effect of continuous metallic conductors as a *medium for sound*, and increases the effect by electrically insulating both the conductor and the parties who are communicating. It forms a speaking telegraph without the necessity for any hollow tube.

"Each of these persons holds to his mouth an instrument analagous to a speaking trumpet, in which the words may be easily pronounced and the sound concentrated upon the wire; another instrument is also applied to the ears to receive the voice of the opposite party."

In Friedrichsdorf, Germany, an apparatus was invented in 1861 and called "The Telephone." The inventor was Philipp Reis, who published in the annual report of the Physical Society of Frankfort-on-Main in 1861 an article in which he says: "The surprising results in the domain of telegraphy have often already suggested the question whether it may not also be possible to communicate the very tones of speech direct to a distance;" and in the course of a very able treatise on sounds and their transmission by telephone Reis says: "Until now it has not been possible to reproduce the tones of human speech with a distinctness to satisfy everybody. The consonants are for the most part tolerably distinctly reproduced, but the vowels not yet in an equal degree."

On May 8, 1862, the *Didaskalia* published an article giving notice of a lecture to be given by Reis on May 11, and says, "since the last lecture the invention has been constantly developed and will no doubt become of great importance."

Professor P. H. Vander Weyde, of 236 Duffield street, Brooklyn, N. Y., constructed a set of Reis telephone apparatus and exhibited them before the class of Physics in the Cooper Institute, and an account of it was published in the *Manufacturer and Builder*, New York, seven years before Bell's 1876 patent.

The foregoing inventions were all that was known of the telephone up to the end of the year 1876, except a modification of the receiving instrument made by Bell and exhibited at the Philadelphia Centennial Exposition in the summer of 1876.

The office files and wrappers in Bell's case filed Feb. 12, 1876, show very peculiar emendations and official action. A man by the name of Zenas F. Wilber was the examiner in charge of the electrical department in the Patent Office, and subsequent events have shown him to have been very untrustworthy. He has made an affidavit that he showed Bell Gray's caveat before March 7, 1876, and on March 3 Wilber went to Gray's attorney, Mr. Baldwin, and showed him Bell's application. For this he is said to have received $100 from Bell.

On Feb. 19, 1876, Bell and Gray were placed in interference as to Bell's application and Gray's caveat, and Gray was directed to complete his application within three months. The points of interference were:

1st. The receiver set into vibration by undulating currents.

2d. The method of producing the undulation by varying the resistance of the circuit.

3d. The method of transmitting vocal sounds telegraphically by causing these undulating currents, etc.

Bell's application was suspended for ninety days.

On Feb. 24, Bell's attorneys protested to the Commissioner of Patents that Bell's application was on file in the Patent Office prior to Gray's caveat. The Commissioners decided that if it was proved that Bell's application was first on file then the caveat should be disregarded, and this being shown on the chief clerk's cash blotter Bell's attorneys were notified Feb. 25 that the suspension of Bell's application was withdrawn, and consequently a patent was issued to Bell on March 7. Nothing more was done by Gray in the Patent Office. In a pamphlet entitled "Experimen al Researches in Electro-Harmonic Telegraphy and Telephony," written by Gray in 1878, on page 84 he says: "The official notice of withdrawal of the notice to complete was sent to my attorney and was forwarded to me at Philadelphia where I was then stopping on March 3d. A few days after this notice was sent, the first patent to Bell was issued before I could possibly have had time to complete my case, as I was busily engaged at Philadelphia in exhibiting and in preparing for the Centennial Exhibition, where I proposed to show my apparatus, or so much of it as was sufficiently completed. I paid but little attention to the patent of Prof. Bell when issued, particularly as I could not discover that it contained anything relating to the articulating telephone. I determined therefore to complete my application as soon as I could command the time to make the necessary apparatus. To that end I made several experiments in the Exposition building as opportunities occurred. I had talked about and explained this invention to a few people, among whom were Dr. White and Prof. Barker, of the Pennsylvania University, and intended to exhibit it before the exposition was over, an intention which would certainly have been carried out but for the fact that to my surprise (as this was the first I knew that any one was experimenting on articulating telephones) Prof. Bell placed on exhibition a speaking telephone upon a different plan from mine, which although producing results of a very inferior character was still sufficiently striking to demonstrate the principle which underlies its operation: and he furthermore claimed that it was covered by his patent which had been filed simultaneously with my caveat. I therefore at first determined to say nothing to the Judges about my own work in that direction. Subsequently, however, I reconsidered the matter and sent to Washington for a copy of my papers but did not receive them until after I had become busily engaged in making preparations to exhibit my multiple telegraph system to the Western Union Telegraph Company on a wire between New York and Philadelphia. My partner being very anxious that no time should be lost in doing this I was obliged to relinquish the matter of the articulating telephone for the time being."

On the 10th of April, as before stated, McDonough filed his application for a patent, one month before Bell's lecture and before Gray was surprised by Bell's apparatus being placed on exhibition in Philadelphia.

McDonough was put in interference with Bell's patent, and afterwards with the applications of:

Richmond, Aug. 24, 1877.
Gray, Oct. 29, 1877.
Dolbear, Oct. 31, 1877.
Edison, Dec. 24, 1877.
Holcomb, Jan. 28, 1878.

The above applications were put in interference with Bell's patent and with one another, and they were all put in interference with four other parties, Voelker, Blake, Berliner, and Irwin, upon claims more or less broad, involving both the principle or some of the parts. These interference cases were subdivided, and McDonough's interference was placed in case G. The subject matter of this case was as follows: "Held to embrace a receiver containing an electro-magnet, and a diaphragm supported and arranged in close proximity thereto and adapted to respond to variations in the electric current passing through the coils of the magnet when used in connection or combination with a transmitter adapted to create sound-producing fluctuations in the electric current, whether said electrical variations, waves, pulsations or undulations represent or are derived from sound waves or mechanical vibrations."

The Examiner of Interferences, after a careful examination of the whole case, found the proof on the side of McDonough, that he first produced and used an apparatus embodying the above principles, which were the controlling ones in a telephone receiver, whereupon all the other parties appealed to the Examiners in Chief, and they reversed the Examiner's decision in McDonough's case, and awarded the priority to Bell, not on the merits or dates of the invention, but because McDonough had not invented what they thought was a proper transmitter also.

From the Examiners in Chief McDonough appealed to the Commissioner of Patents, Hon. B. Butterworth, who handed down a decision on March 3, 1885, and published in the Official Gazette March 24, in which he confirms the action of the Examiners in Chief.

In rendering the decision the Commissioner remarks: "When an applicant seeks to overthrow a patent granted to one who, though junior in date of conception has yet shown diligence in filing his application and reducing his invention to practice, the former must, in view of the importance, not merely to the patentee but to the general public, show entire freedom from laches. Nothing could sooner bring the patent system into disfavor than to permit a patent granted for a valuable invention in which thousands have become interested to be overthrown by a competitor in the same field of invention, on evidence which fails fully to establish the superior claims of the junior applicant to be adjudged the prior inventor, and it is in view of these facts that doubts are resolved in favor of the patentee."

"To defeat a patent it is not enough for an applicant to show that he was experimenting in the same field of investigation, and that his experiments finally led up to the invention in controversy. He must have been first to conceive the thing in controversy, not merely to have conceived it possible to construct a device which would produce the result sought. In the case under consideration it was not enough for any one of the parties engaged in the interference with Bell's patent to show that he conceived that an apparatus could be so constructed as to transmit articulate speech by the utilization of an electric current. Such an idea was not new nor does it occur that apparatus were wanting which were constructed for that purpose, and which would transmit or reproduce sounds. The thing for which the commercial and scientific world was waiting was a method and apparatus for transmitting articulate speech in such manner as to preserve what the scientists and counsel term quality, by which is meant that characteristic of sounds which enables us to distinguish the voice of one individual from that of another. It is not enough that an applicant ranging through the field of experiment unconsciously stumbles upon that which is nearly related and very similar to the device in controversy. The conception must not be of the result to be attained, but the means (which is the patentable thing) to produce that result."

There certainly can be no exception taken to these principles governing the practice of the Patent Office, but it is important that they be applied at the right time and to the right case.

An impartial examination of McDonough's case will confine it to the state of the art as it existed on April 10, 1876, and not seek to view it in the light of events which have transpired during the course of nine succeeding years. Events probably entirely different from those which would have happened in the natural order of things, had not the blunders, ignorance and delays of the Patent Office and the faithlessness of at least one of its employés, placed obstructions in the natural channels of development of the speaking telephone.

What are the facts. The object of McDonough's invention was clearly stated to be a means for transmitting articulate sounds from one place to another through the medium of electricity, and in the interference suit McDonough produced several persons who had heard articulate speech through his instrument prior to Bell's application for a patent. One witness, J. E. McDonough, says, "I heard singing; I heard 'Down come Uncle and Aunt; down come sister Keturah.'"

Gray, it will be seen, had only a belief that his device would convey articulate speech and it has not been shown that it did. In his lecture in Chicago, Feb. 27, 1877. Gray distinctly disclaimed being the inventor of the speaking telephone.

On Oct. 31, 1877, Professor Bell lectured before the Society of Telegraph Engineers in London, and after exhibiting a drawing of Fig. 7 of his March patent, he said: "The results, however, were unsatisfactory and discouraging. My friend, Mr. Thomas A. Watson, who assisted me in this first experiment, declared that he heard a faint sound proceed from the telephone at his end of the circuit, but I was unable to verify the assertion."

In the telephone case in the High Court of Session before Lord McLaren, Edinburgh, the United Telephone Company, Limited, proceeded against Alexander McLean, of Edinburgh, for infringing the English patents of Bell and Edison.

The complainants put Sir William Thomson on the stand and the following is an extract from the testimony, Jan. 24, 1882:

Question. You were one of the judges at the Philadelphia exhibition, and when there was your attention called to some device of Bell for reproducing sounds? Answer. Yes.

Q. And to those of Gray and prior investigators? A. Yes.

Q. Were they intended to be used as Harmonic Telegraphs? A. A combination of them was intended to be so used. Mr. Bell explained that by an arrangement of a number of such instruments *he would be able* to make a speaking instrument.

Q. Were these make and break instruments? A. Yes, I believe so.

Q. Were they capable of transmitting the Morse and other forms of alphabet? A. Yes, and were so far as shown make and break.

Q. Were those shown you by Bell capable of vibrations; had they all the common quality of musical vibration and capable of producing a fixed note? A. Yes.

Q. But not capable of transmitting articulate speech. A. No.

Q. Did he show you many varieties? A. Yes.

Q. They were not so new as something you were shown afterwards? A. No.

Q. He did show you a number of those which were vibratory? A. Yes.

Q. After Bell had shown these did he show you anything else? A. Yes; he showed us something which he said he would hardly call an invention, but which might ultimately become an invention.

Q. What did he show you? (The witness was here shown the telephone given him by Bell.) The telephone shown, was it to be used in connection with a battery and a line wire? A. Yes.

Q. What did Bell say about them? A. He said he could show us something which would speak, and on that occasion, in presence of the Emperor of Brazil, and after some troublesome adjustment, it was made to speak. I heard the vowel "o," and "to be or not to be," and "there's the rub."

Q. He stuck to monosyllables? A. Yes.

Q. And was this after troublesome adjustment and many orders to his assistant, and he had tried to see whether it would do? A. Yes. I felt so very much interest that I went too far and said, the thing is done. I urged Mr. Bell to go on, and before the close of the meeting he had improved his adjustment. My friend Watson heard it very faintly. It required very minute attention, but I am absolutely convinced that I did hear it.

Q. Was that after careful and troublesome adjustment? A. Yes.

Q. Did you understand what Bell was after? A. Yes; one thing was the adjusting of the membrane which was liable to be put out by the breath of the speaker, and another the adjustment of the battery, which I knew to be a difficult one. The only way it could be heard was by the ear being pressed upon the disc. If pressed too heavily it would kill the sound, and if too little the same result ensued. The great difficulty was the adjusting the ear.

Q. On the only occasion on which you heard at the receiver shown by Bell at Philadelphia, was the piece of metal free and separate at one point? A. Yes.

Q. When you heard it was it fulfilling the purpose of a vibrating tongue? A. Yes. My impression at the time was that when my ear pressed too hard there was no sound, and when too light there was no sound.

Q. Was the instrument shown you by Bell commercially useful? A. No.

Q. Was it an invention in the course of discovery to make it commercially useful? A. Yes, and I did all in my power to encourage Mr. Bell to proceed.

Q. Was there anything in what Mr. Bell told you to enable you to make a telephone? A. No.

Q. He gave you instruments? A. Yes.

Q. And what did you do? A. I tried them and worked a good deal with them. I tried various combinations of battery power, but all with no effect.

Q. Did you fit it up precisely in the same way as Mr. Bell? A. Yes.

Q. Did you get any instructions from Mr. Bell which would enable you to fit it up and make it speak? A. No.

Q. How long did you continue your experiments? A. For some considerable time, making several experiments; *but never got it to speak a word.* Other duties necessitated my laying it aside for a time.

Q. When you got the instrument from Bell in what position was the tongue at the top? Was it screwed down at one side and free in its other parts? A. Yes.

Q. Did you drop your experiments with the instruments in Glasgow as a failure? A. Yes. I was confident it was in good hands.

Q. Did you consider that you had got the idea of a completed instrument? A. I felt convinced that I could not make the instrument to show it to my class. I could have got such an instrument from Bell, but I preferred to leave it in his hands.

Q. Are you aware of the progress Bell afterward made? A. Yes.

Q. You have read the specification of Mr. Morgan Brown (Bell's English patent, Dec. 9, 1876)? A. Yes.

Q In the specification do you find any improvement on the instrument shown you at Philadelphia? A. Yes; one was instead of putting the battery in the line wire through the electro-magnet, to use a permanent steel magnet, no doubt as an equivalent of the electro-magnet; an ordinary electro-magnet might have been used, but an ordinary steel magnet was found sufficient.

Q. Have you any equivalent for the permanent magnet in the soft iron core with the local battery? A. Yes.

Q. Was Hughes' microphone not the first instrument with what you call delicacy of contact introduced? A. No. I think not; we had it in Reis'.

Q. Was there any transmitter in use in this country prior to March, 1878? was the Bell transmitter? A. I do not know of any having been in common use.

Q. Is there anything in Hughes' microphone which is not in Edison's? A. Nothing.

Q. Could it be so refixed as to make the make and break arrangement? A. Under certain arrangements it might be so made.

Q. Suppose for a moment that the respondent's transmitter is useful for articulate speech and that it has a make and break arrangement. A. I would consider it a defect although the instrument might still speak.

From the foregoing it is clear that Bell's apparatus up to the summer of 1876 was not a practical affair.

It is from this standpoint that the Patent Office should look at the case and from no other. On what ground does the Patent Office give Bell a patent for a device that had never demonstrated that it was capable of articulate speech and refuse a patent to McDonough for a device which he proved by witnesses had talked? The Patent Office allowed Bell to incorporate in his patent theoretical claims which prevent any one else from developing a speaking telephone upon principles entirely different from those underlying Bell's, Fig. 7, and his subsequent improvements. This is the most astonishing feature of the whole Patent Office malpractice in this case. To give a patent to Bell for a theoretical combination which he himself afterwards publicly proclaimed to be useless, and to allow him claims which the courts construed as covering other methods of conveying articulate speech, entirely, absolutely and fundamentally unlike Bell's theoretical method, and after granting this patent the Patent Office denies to McDonough any protection for his achievements which up to that time were of vital necessity in the development of the telephone.

As a matter of fact the present commercial telephone is the Reis-McDonough device, merely improved in some of its details, and neither the apparatus as shown in Fig. 7 of Bell's 1876 patent, nor any of his alleged later improvements, are embraced in the system now in public use, and this opinion is seriously held by the best disinterested lawyers and electrical experts in this country. In the Journal of the Franklin Institute, January, 1887, page 49, the editor, Prof. Edwin J. Houston, in an article on the Reis telephone, states "that he held an almost uninterrupted and quite intelligible conversation continuing for some five or six minutes, in which questions and answers were given and received by the use of a transmitter which was an exact reproduction of the Reis bored block transmitter, and employed the platinum contacts found on the Reis apparatus;" and on page 50 he says: "It is perhaps difficult for one not living in America to credit the extent to which at the present moment the courts have sustained the legality of Mr. Bell's claims to the invention of the articulating telephone. If they had only awarded to him patent rights for improvements on the electrical transmission of speech, the point we have here made would lose its significance, but in America, Bell at present is held from a legal standpoint to be the first and only inventor of the telephone, and is awarded the sole legal rights to employ electricity in the transmission of speech. This, we contend, in view of the above, is certainly at fault from a scientific standpoint, and we are disposed to believe from a legal standpoint also."

Gen. Thomas Ewing, in a very learned opinion given in New York, Aug. 7, 1883, concludes as follows: "Hence I am of opinion that the claims of the Bell Company to a monopoly of the telephone business of the United States, founded as it is on the patent to A. G. Bell, of March 7, 1876, cannot be sustained.

"First. Because that patent has no valid relation to the art of transmitting speech, for two reasons:

"*a.* It is not claimed in the specification that one of the uses of the invention is to transmit speech.

"*b.* The specification does not so describe any device that an artisan fairly skilled in transmitting sounds by electricity could at that time have made such device and transmitted speech with it.

"Second. Because if the patent were otherwise valid as applied to the transmission of speech, the broad claim made under it to a monopoly of the use of electricity or of undulating currents of electricity in transmitting speech is invalid for the following reasons:

"*a.* Bell was not the first to discover the art nor invention of the means of transmitting speech by electricity or by undulating currents.

"*b.* The claim is too broad—falling directly within the condemnation of the eighth claim of the Morse patent by the Supreme Court of the United States in the case of O'Reilly vs. Morse.

"*c.* The claim to the exclusive use of undulating currents of electricity in transmitting speech involves the specification in contradiction and ambiguity which vitiate the patent.

"*Third.* Because the process of transmitting speech described in the patent of 1876 is false in theory and obsolete in practice, and that all that is new in the device is utterly worthless. No process or device at all similar in principle is now used anywhere in telephony."

"*Finally.* I am of the opinion that there have not been such judicial determinations favorable to the broad claims made under this patent as to justify a court in assuming their validity on motion for preliminary injunction, if the defendants set out the defenses above indicated and are prepared to sustain them by such ex parte testimony as is readily accessible."

Sir William Thomson, the most eminent experimental physicist and electrician living, could not make Bell's original apparatus work, and Frank L. Pope, E. S. Renwick and W. S. Goodrich, all experts in electrical matters, made instruments in February, 1879, exactly conforming to Bell's description of the device, Fig. 7, and could not make them speak a word after two and a half days' trial. The position taken by Commissioner Butterworth is rendered untenable from his own declarations, as at the time McDonough's claim was before the Patent Office, it was not true that a patent had been granted for a valuable invention in which thousands had become interested. But it is true that the junior competitor could have established superior claims to a more practicable method of transmitting speech, as subsequent investigation proves, because he is still the undisputed prior inventor of the membrane electro-magnetic receiver, combined with an improved Reis transmitter. This has not been denied by the examiners in chief, nor the Commissioner of Patents, and when a set of apparatus is made in accordance with McDonough's description, they will talk and talk well.

The Commissioner lays stress on the fact that McDonough's witnesses are all his relatives or near friends. It seems natural that a man developing such an important invention would show it only to his trusted friends, particularly as he was residing in Chicago, with Gray; and as the purposes of his invention were so clearly set forth in his application, what honest mind can doubt that he secured the results to warrant his application for a patent. Is it not more in his favor than the statements made by Bell and Sir William Thomson are in favor of the device of Bell, shown in Fig. 7, which the application did not hint was for the purpose of transmitting articulate speech? It is, then, to Bell, instead of McDonough that the following language of the Commissioner applies, viz.: "There is not infrequently a disposition on the part of an applicant to confound a strong desire in the mind to produce certain results by some means of which he has but a vague and indefinite conception with an intelligent conception of a machine adapted to accomplish those results."

The great mistake made by Bell, Gray, and McDonough, was in the scramble of each one to be ranked as the original inventor of the speaking telephone, when the most that can be said of them is, that each was struggling to produce an apparatus that would so far be an improvement upon Reis as to transmit articulate speech with greater facility.

Bell conceived an idea that he could utilize the principles of his harmonic telegraph to convey the sounds of the voice over the wires, but as he had not talked over the wire, he carefully avoided making a claim which could not be demonstrated by any one skilled in the art.

What he declares to be "oscillation," "vibration" and "undulation" as applied to currents, are synonymous terms. The currents are to and fro, alternately positive and negative, and are no more undulations than stringing a lot of red and white buttons upon a wire, so that they do not touch one another, the red being positive and the white negative, and their edges and spaces between forming undulations. It is true there may be a technical difference in the modus operandi of the currents in Bell's harmonic telegraph, and Fig. 7 device with the battery and with the permanent magnets, but practically the result is just the same, without a material change of principle. Sir William Thomson avers that the permanent magnets are equivalents of the electro-magnets.

In McDonough's and Gray's system as shown in their respective application and caveat, the current was never reversed as to its polarity. The operation of the transmitter merely set it into undulations by increasing and decreasing its volume just as is done in the present transmitters in public use.

After it had been decided that Bell's magneto telephone could not become commercially useful on account of its want of power, Berliner, Edison, and others, set to work to overcome the difficulties. The result was that Edison and Berliner succeeded in arranging a telephone circuit, embracing a McDonough receiver, with an improved Reis transmitter and an induction coil, the secondary of which was inserted in the line wire, and the improved transmitter in the primary wire with a battery, and thus it is worked to-day.

It is my opinion that had not McDonough's progress been barred by the unwarranted action of the Patent Office, and had his invention been protected by patent, the change from his style of transmitter to the present was more natural by all odds than anything possibly suggested by Bell. As to the parchment diaphragm being replaced by an iron diaphragm I maintain that it involves no invention, inasmuch as the adoption of the iron was only to obviate the effects of moisture on the parchment, and there are other substances, such as mica, that can be used to advantage. Sir William Thomson's testimony shows that Bell used a parchment diaphragm transmitter at the Philadelphia exposition, and that the speaker's breath affected it unfavorably.

The theoretically improved transmitter of Gray as shown in his caveat and the later practical improvements of Edison, Berliner and Blake, are as before stated, directly based upon Reis' original device. While McDonough was the first to conceive and put into shape the only practical receiver embracing a stretched membrane and electro-magnet, it is also shown in his evidence before the examiners that he used a diaphragm of sheet iron.

It is, however, clear to my mind that Bell afterwards conceived the idea of operating such a receiver in connection with a transmitter entirely different in principle from that of Reis. A glance at Fig. 7 of Bell's patent will show that the receiver was *not* intended to be used as a transmitter, and thereby simply performs the functions which Bell did not describe nor claim, and which McDonough claimed with great particularity. The transmitter of Bell involving the same principles as his harmonic telegraph, is certainly entitled to patent protection, and Bell is entitled to great credit for the idea, but it was a useless thing without McDonough's receiver to record the sounds.

I am not aware of any rule defining how perfect a device must be before protection is afforded by letters patent, but that Bell could appropriate and patent the McDonough membrane receiver, which was up to that time unquestionably the greatest stride forward from Reis in perfecting a speaking telephone, is something entirely repugnant to a sense of justice. I do not think that the case is changed by the fact that Bell discovered the reversibility of McDonough's receiver and so used it to send as well as to receive. Under some court decisions it makes McDonough's claims stronger, and Bell's weaker, even to his own combination.

Upon the foregoing premises, the entire structure on which Commissioner Butterworth's decision rests crumbles away.

The Commissioner says: "After Bell had invented and successfully introduced his speaking telephone, McDonough unpacked his trunk and brought out the device mentioned, and in the light of what Bell had taught the world, concluded that he (McDonough) had been ahead of Bell in producing a speaking telephone." The facts are exactly the reverse of those assumed by the Commissioner. Great stress is made upon the make and break principle involved in McDonough's attempted improvement of Reis' transmitter. The idea seems to have been impressed upon all the courts by the Bell counsel and their well-paid experts that this transmitter was like an old-fashioned door knocker which opened several inches every time the membrane was moved by the air waves of the voice. It never occurred to these learned gentlemen that the very platinum points themselves were thrown into a state of molecular vibration, just as was the case in Meucci's wire when it conveyed an exact copy of the human voice throughout its length. And in the improvements of McDonough, Edison, Berliner and Blake it was only in degree and not in principle that they differed from Reis. The conducting particles forming the channel of communication in the liquid possessing high resistance of Gray's transmitter were not sufficiently thrown apart by the action of the voice to accomplish any useful purpose, so in Reis and Gray we have the extremes and in McDonough and Edison the mean.

Strongly confirmatory of this view, Mr. W. H. Preece, electrician in chief of the British government telegraphs, in an article published in the *Telegraphic Journal*, Sept. 1, 1877, page 200, says, "Edison starting from Reis transmitter, he simply substitutes for the platinum a small cylinder of 'plumbago.'"

The whole subject should be viewed in the light of the circumstances surrounding it at the time of McDonough's application.

The Commissioner further says in giving his decision, that "McDonough does not know that he has invented anything to offer to others." How can this be accepted in the face of what McDonough declares he invented in his application, and how can he be refused a patent on such a ground when Bell was allowed one for what he told Sir William Thomson at the Centennial Exposition "was not an invention."

The Commissioner further states: "Bell's patent was issued on the 7th of March, 1876. At the Centennial Exposition held at Philadelphia that year (1876) he exhibited his telephone, and it was adjudged by such eminent scientists as Professor Henry, Sir William Thomson, of England, and Professor Gray, one of the contestants herein, to be a success."

Sir William Thomson's sworn testimony hereinbefore given, will show directly to the contrary, although on this occasion it was exhibited with improvements not shown in Bell's patent, with which the Commissioner rightly had only to do.

During the month of May, 1881, McDonough made four applications for patents, which were merely divisions of his application filed April 10, 1876, and in these applications he omits certain broad claims which were contained in the first, viz.:

"Broadly, the art of transmitting articulate speech by electricity.

"Broadly, a variable resistance contact transmitter for electro-speaking telephones.

"Broadly, a magneto receiver for electro-speaking telephones."

Four patents were allowed upon these applications, as follows: No. 245,554, Aug. 9, 1881, claim:

"The combination substantially as hereinbefore set forth, for a telephone-receiving apparatus, of a helix and magnet, and a connecting post to which the wires of the helix are joined, mounted in one end of a frame or holder of wood, or such like insulating material; a membrane mounted on the opposite end of said frame or holder, a portion of the face of which membrane presents a material, attached to and supported wholly thereby, capable of being attracted by the magnet and in close proximity thereto, so that the said membrane shall be caused to vibrate by the action of pulsations in an electric current in the helix around the magnet with a sound recess at the opposite side of the membrane from the magnet to confine the sounds received therein and exclude exterior sounds from the ear of the listener and adapted at the same time to allow the ear of the listener to be placed in close proximity to the membrane, all constructed and arranged to operate substantially in the manner described.

No. 246,800, Sept. 6, 1881, claim:

"The combination, substantially as hereinbefore set forth, of a magnet, a helix, and a receiving-membrane, a portion of the face of which presents a material, attached to and supported wholly by the membrane, capable of being attracted by the magnet and in close proximity thereto, with connecting wires, a voltaic battery, and a transmitting membrane, conducting pieces connected thereto and to the circuit wires, a circuit controller resting upon said pieces and entirely supported thereby, and arranged to vibrate in connection with the membrane, and a regulating nut to limit the movement of the controller with relation to said contact pieces, all combined to operate in the manner set forth, so that the said controller when at rest completes the circuit of the battery, and when in motion, by means of sound waves, causes electrical pulsations in the connecting wires and helix around the magnet and vibrations of the membrane of the receiver."

No. 248,002, Oct. 4, 1881, claim:

"The combination substantially as hereinbefore set forth, of a transmitting membrane composed of vellum or any suitable material that is sensitive to the vibrations of sound, and two pieces of conducting material attached to and receiving motion from the same, and included in an electric circuit, a circuit-controller resting upon said plates, and suitable means, as shown and described, for adjustably limiting the vibrations of the controller with relation to said plates, the whole combined to operate substantially in the manner and for the purposes set forth."

No. 250,827, Dec. 13, 1881, claim:

"The combination, substantially as hereinbefore set forth, for a telephone receiver, of a frame or holder, an electromagnet, a diaphragm carrying upon its face near the magnet a piece of magnetic material, and secured to a rigid circumferential supporting band or rim, said band or rim, with its attached diaphragm, being removably held in the frame or holder, all as set forth, so that the diaphragm may be removed and replaced together with its band or rim, or separately transported, and when in place may be immediately put to use and made to vibrate and produce sounds."

There is no room for wonder that the marvelous possibilities of the speaking telephone which excited the entire civilized world in 1878, should have aroused the cupidity of the strong and the weak alike. The Western Union Telegraph Company formed the American Speaking Telephone Company in November, 1877, and secured the inventions of Gray and Edison, and immediately, through the Gold and Stock Telegraph Company, started a most vigorous competition against the Bell Company. In published circulars and through official sources the Western Union combination denied the claims of Bell. This resulted in a suit in Massachusetts between Bell and the Western Union, but the contest was not carried to a final decree, a compromise being effected by which the Western Union leased and transferred to the Bell Company the Gray and Edison patents, and agreed to abandon the telephone business, and the Bell Company agreed not to compete with the Western Union for telegraph business, and to pay that company twenty per cent. of its net earnings on royalties from one hundred and seventy-five local license companies. If the Bell Company did not hold patents tributary to the Western Union, why compromise upon such a princely percentage?

Another interesting suit was entered in 1881 by the American Bell Telephone Company against the Peoples' Telephone Company, owning the inventions of Daniel Drawbaugh, of Eberley Mills, Pa. The defense sought to show that Drawbaugh had invented, between 1867 and 1875, everything embraced in the present combination telephone in public use, and over one hundred witnesses were produced and testified in support of Drawbaugh's statements, and many identified some of the exhibited apparatus. Never was such an influential attack made upon the patents of a successful enterprise in this country. The stock of the Drawbaugh Telephone Company, which actually conducted the suit, was $15,000,000, and governors, Senators, bank presidents and millionaires galore were directors and trustees. After a most exciting contest Judge Wallace said: "Without regard to other features of the case, it is sufficient to say that the defense is not established so as to remove a fair doubt of its truth, and such doubt is fatal." "A decree is ordered for complainant."

Many suits have been successfully contested by the American Bell Telephone Company against various alleged infringers of Bell's 1876 patent, on the ground that Bell controls the whole art of telephony, no matter how different it may be in principle from his method. It is stated on the best legal authority, "that in none of the litigations of the Bell Company has the validity of its broad claims under the patent of 1876 and 1877 been tried at all in a court of law, or contested to final decree in equity; and that the final decrees already rendered have either followed compromises, or have been preceded by admissions which in effect surrendered the controversy."

Gray practically abandoned his 1876 caveat, but has recently attempted to revive it, but with considerable doubt of success, on account of his public lectures and publications having undermined his standing in the Patent Office.

In order to be just to all the claimants to the telephone, the following taken from the Summit *Beacon*, Akron, Ohio, about September, 1877, may be of interest.

"We had the pleasure this morning of a call from Dr. Austin Cushman, of New Lisbon, Ohio, many years since a practicing physician in this city. The Doctor is an accomplished electrician, and an enthusiast besides. He was a pioneer in the putting up of telegraph lines in the Northwest, and during his varied experience made frequent experiments in telegraphy, which indeed he even now continues at his home in New Lisbon, Ohio. The genial Doctor has lately been devoting considerable study to the telephone, and makes the remarkable statement that so long ago as 1848 he accidently discovered the principle of this "recent" invention. He had just put up a telegraph line 27 miles long in the State of Wisconsin, when, in absent-mindedly drumming on a table, he found that the sound was conveyed to the other extremity of the line. Other experiments confirmed the first discovery, but nothing ever came of it, though we believe the Doctor's rude apparatus, discovered through accident, may be set down as among the very first telephones in existence."

Within the past year a company in Chicago has begun the manufacture and sale of telephones upon the ground that Cushman's discovery lays the invention open to public use, and a contest at present exists between this company and the Bell Company, to restrain the former from infringing the Bell patents.

A Swell Showman.—The *New York Times* says: James A. Bailey has resumed his association with P. T. Barnum. Mr. Bailey does not mean to distress himself by unnecessary exertions in traveling in the interest of the show. He has earned the right to mingle luxury with his labor, he thinks, and he has ordered of the Pennsylvania Railroad a palace car. It is to be of unusual length. It will carry Mr. Bailey and a valet, Mrs. Bailey and a maid, and a French cook as well. It will be electrically lighted, and a library and a piano will be among the accessories when chat flags. A telephone will be attached, so that in wet weather, when the car is side-tracked in the towns where the circus spreads its canvas, Mr. Bailey can be with the show all the time without being near it at any time.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, Nov. 28, 1887.

At a meeting of the aldermanic committee on lamps and gas in Brooklyn last week, Mr. J. D. Bell appeared for the Edison Electric Light Company, which seeks a franchise. Mr. Chinnock explained that the company's plan had been approved by the Subway Commission, and that it proposed to do strictly an indoor light and power business. Its capital is $500,000. No action was taken at the time.

A short time since the Union Fire Alarm Company, of 145 Broadway, received a contract for the installation of its system at Kent, O. The system, after being under test for several months, has been reported as very satisfactory, and payment has been made in full.

It is the tendency of such a growing business as electricity to specialize itself; every year is seeing new and distinct departments made. J. Lamson & Brother, 77 Maiden lane, devote their attention to manganese for electrical batteries, having every facility for the production of it in large quantities. The firm are also headquarters for asphaltum, a material which has practically been unknown to the trade as such. It is an excellent non-conductor, as well as a waterproof insulator. By some it is classified with tar, pitch, etc., but it is a material of entirely different nature, being a vegetable compound.

Chas. A. Schieren & Co. report the following sales of electric leather belting during the past week: Glens Falls Electric Light and Power Company, N. Y.; Edison Electric Light Company, York, Pa.; Skowhegan Electric Light Company, Skowhegan, Me.; G. W. Childs, Philadelphia, Pa.; Allbright, Sons & Co., Allentown, Pa.; H. L. Childs & Co., Pittsburgh; Cross, Austin & Co., Brooklyn.

The old house of C. Baxter, 40 Fulton street, Brooklyn, is now H. E. & C. Baxter, 18 Fulton street. The firm are engaged in the manufacture of electrical apparatus and supplies of all kinds for household, office use, etc. Their latest specialty is a new gravity-drop, Norway iron annunciator and burglar alarm. The Otto bell, which they also make, has become a staple production, for which the demand is extensive throughout the United States and Canada. When I was in the factory an order was being shipped to Oregon. Among the other novelties which they are introducing may be named letter boxes with the plain surfaces highly polished in nickel and brass, and a new style of mouthpiece, push-button and name plate combined, in very neat form.

It will interest a great many to know that Mr. Sweeney, 21 N. J. R. R. avenue, Newark, N. J., makes a specialty of small castings for bells, annunciators, telegraph instruments, medical batteries and other electrical apparatus.

Mr. H. A. McLean, agent for the Edison system, 65 Fifth avenue, reports a plant for the new club-house of the New York Club, Thirty-fifth street and Fifth avenue, including one 400-light dynamo and one 10½ × 12 Armington & Sims engine. Another plant for Robbins & Appleton, the publishers, 5 Bond street, includes 150 lights.

Messrs. Buehler & Bateman are installing a 450-light Edison plant in the new building of the American Express Company, at Forty-eighth street and Madison avenue.

Mr. F. C. Mason, Superintendent of Police Telegraphs, Brooklyn, has recently come into possession of a Mexican remedy for rheumatism which has effected some remarkable cures of that painful disease. The remedy was discovered by his brother, B. D. Mason, United States Deputy Surveyor of Fairview, New Mexico, during a visit to Mexico several years ago. Among the remarkable cures effected is that of Mr. Frank O. Clark, of 415 Fulton street, Brooklyn. Several telegraphic friends of superintendent Mason, who have suffered with rheumatism and neuralgia, are loud in the praise of the remedy. A depot of distribution has been opened at 19 Park Place, New York. Any one suffering from rheumatism will receive a bottle by mail free of charge by sending their address to the Ideal Medicine Co. at that address.

Mr. Chas. Carter, 286 Fulton street, Brooklyn, formerly electrician to the United States Electrical Company, is carrying on quite an extensive wholesale and retail business, having retained no small share from the old concern. He is giving particular attention to construction work, electric gas lighting, bell, annunciator and alarm service.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Nov. 26, 1887.

Mr. I. Lovett, superintendent of the Midland Electric Company, Omaha, Neb., dealers in electrical apparatus, has been enjoying a visit to relatives in this section during the past week.

Advices from North Adams, Mass., say: "The work of lighting the Hoosac Tunnel has been delayed by the building of the trenches which will conduct the wires. In these trenches steam pipes will also be laid for heating the tunnel, so as to prevent the damage from frost to the brick arches."

Station No. 2 of the Edison Electric and Illuminating Company, Boston, is nearly finished. The conduits for the numerous circuits are nearly all down. The tunneling under Court street is about completed and will prove a creditable as well as a successful piece of work. The cables to be used in the tunnel, for joining the two sections of the Edison three wire system at either end of the excavation, are from the works of the Eastern Electric Cable Company, Boston. There are three cables, each No. 341 Edison gauge, composed of stranded wires, the outside diameter of the insulation of each cable being 1¼ inches.

On the evening of Nov. 22 the directors of the Milford, Mass., Electric Light and Power Company voted to increase the capital stock of the company by $10,000, making the total stock $40,000. It is said that by a recent special act of the Massachusetts Legislature the company was given the right to increase its capital to $60,000. The new stock will be issued as soon as possible.

The Cunningham Iron Works Company, of Boston, has this week received orders for four 72-inch steel boilers for the Utica (N. Y.) Electric Light Company, one 72-inch steel boiler for the Newton (Mass.) Electric Light and Power Company, and four 66-inch boilers for the Albert copper mines, Capelton, Province of Quebec.

The Middlesex Electric Light Company, of Lowell, Mass., is building an addition to its station, and has ordered a Wainwright feed-water heater of 500 h. p. capacity.

The Wainwright Manufacturing Company, Boston, reports recent shipments of its corrugated tube feed-water heaters to the Portland Electric Light Power and Company; Presque Isle Electric Light Company, Phillipsburg Electric Light, Power and Heat Company, Pa.; East End Electric Light Company, East Liberty, Pa.; West Point (Va.) Water, Light and Power Company; American Illuminating Company, Augusta, Ga.; De Land (Fla.) Electric Light Company; two to Tokio, Japan, and one in the C. P. R. R. Hotel, at Banff, Northwest Ty.

The Waterhouse Electric and Manufacturing Company, of Hartford, Conn., reports this week the following firms and companies as having adopted its system of electric lighting: Taft, Weeden & Company, Providence, a thirty light plant in their Weybosset Mill No. 3; Nevada City and Grass Valley, Col., and Cadillac, Michigan, plants for lighting the towns; Jerrechi Manufacturing Company, Erie, Pa., thirty lights, and R. & H. Simon, Union Hill, N. Y.

The Benham Hydraulic Motor Company has located at Providence, R. I. This company was organized recently with a capital stock of $70,000. Gov. Oliver Ames, of Massachsetts, is said to be president of the enterprise.

At the close of the Boston Stock market on Saturday, Nov. 26, telephone stocks were quoted as follows:

American Bell Telephone	$223
New England Telephone	41
Erie Telephone	31
Mexican Telephone	⅜

The *Hoosac Valley News* of Nov. 12 says: The Fitchburg Railroad Company has decided to light the Hoosac tunnel by electricity, and the work will be begun as soon as possible. John A. Grier, of Philadelphia, representing the Frank S. Marr Construction Company, is now in North Adams gathering material and making preparations to put in 1,250 twenty-five candle-power incandescent lamps, which will be placed about twenty feet apart, the line alternating from one side of the tunnel to the other, so that half the number will be on each side. The Westinghouse alternating system will be used. The potential or pressure of the electricity is to be 3,000 volts, which is to be reduced by the Westinghouse converters to fifty volts before entering the lamps. By this system of carrying electricity at a high potential the company claims a great economy in distributing the electrical current, and it is enabled to transmit the current to a great distance with comparative ease. Mr. Grier says that, in addition to lighting the tunnel, it would not be surprising if by means of ventilating fans driven by electric motors, a great portion of the inconvenience arising from the smoke of the engines should be obviated in the near future. He is considering plans with that object in view, although it is not a part of the undertaking now in hand. It will probably be two or three weeks before the work will be begun. The lighting of the tunnel is a big undertaking, and all will hope that the attempt will be successful.

The Boston *Evening Transcript* has the following extract from a communication received from a gentleman connected with the Drawbaugh telephone syndicate:

"The capital has been $3,000,000, divided into 3,000 shares, par value $1,000, and was sold at par and as high as $1,200 per share before the New York Circuit Court decision. Since that decision it has all been pooled, and none has been or can be sold. Recently, on the 9th of November, the syndicate increased its capital to $3,200,000, divided into 32,000 shares, of the par value of $100 each, and has decided to sell some of its treasury stock for the requirements of its business, in anticipation of a favorable decision by the United States Supreme Court, which decision is confidently expected before the court adjourns for the holidays."

W. I. B.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Nov. 26, 1887.

Our bucket shops, like those in New York, still contrive to occupy a good deal of public and official attention. A crusade against the bucket shops was inaugurated by State's Attorney Grinnell this week. The first intimation of it was afforded when the Grand jury was sworn in for the present term. Judge Baker in charging the jury started out at once to tell them that the last legislature had adopted laws for the suppression of bucket shops. The court kept on explaining the law's definition of a bucket shop, so that there would be no misunderstanding on the part of the jury. Proceeding, Judge Baker said: "It is the province and duty of courts to execute the laws as they find them, not to alter or amend them, and the public good requires that when guilt is clear punishment should be certain. Considerations like these, gentlemen, should be an incentive to us in our present capacities to investigate every species of offense and violation of law to protect those who have suffered and to punish their aggressors, so that the weak, the poor, the ignorant and the oppressed may be led to come here to seek redress from their wrongs, no matter how powerful may be the wrong-doers, by whose unlawful acts they have been wronged or oppressed."

I understand that Marcelona, Mich., is to have an electric light plant, and that Gaylord, in the same State, follows suit. At Bay City, Mich., the city council has at last voted to pay $10,000 on the city's electric light outfit. At Marquette, Mich., the council has withdrawn the electric light franchise recently given and is soliciting new bids. The new plant at Lapeer, Mich., is to be in operation by Dec, 1. All of which goes to show that Michigan takes some little interest in the electric light.

I note the following new incorporation:

The Roodhouse Electric and Power Company, of Roodhouse; capital, $5,000; incorporators, Ellis Briggs, Frank Bateman, William Hainsworth.

The Hon. Timothy Nester, Mayor of Marquette, Mich., who is at the Pacific, says that the recent fire in the Calumet & Hecla mines will seriously affect the copper market and that the output will be practically destroyed for six weeks.

The subjoined item from a New Orleans paper is of interest: "General Superintendent Slattery, who has spent the past two weeks in New Orleans, planning the incandescent electric lighting system which the Louisiana Electric Light and Power Company is about to put in operation, completed his labors and departed for the East yesterday. Mr. Slattery has surveyed the entire

city, from Carrollton to the Slaughterhouse, and arranged the circuits so that no one need go without this very desirable system of illumination. The allotment of lamps for the various public buildings has also been made, and the wires will be in and ready for operating by the middle of December. The Louisiana Company's contract for the lighting of public buildings is for five years, from Jan. 1, 1888, and Mr. Slattery claims that it will be done in a superior manner, owing to the exceeding whiteness of his light."

Col. S. G. Lynch, broker, 146 La Salle street, furnishes me with the following quotations upon telephone stock :

Bell of Mo.	$160@$165
Central Union	44@ 45
Chicago	375@ 390
Colorado	18@ 20
Cumberland	62@ 65
Great Southern	30@ 82
Iowa Union	28@ 30
Michigan	76@ 77
Missouri and Kansas	68@ 69
Rocky Mountain Bell	40@ 45
Wisconsin	108@ 109

C. H. M.

PACIFIC SLOPE NOTES.

SAN FRANCISCO, Cal., Nov. 7, 1887.

The reporters for the daily papers got in their work once more in reporting the recent consolidation at Santa Rosa, where a lively fight for public favor has been in progress for a year past between the Pacific Coast Electric Construction Company and the Thomson Houston Company. The facts are as follows: Both companies occupied the field at about the same time, but owing to strong local prejudice in favor of local manufacturers, the Construction Company were enabled to secure the majority of consumers. The Thomson-Houston people proceeded to erect their station, and when it was completed started in with about 20 consumers against 53 for the Construction Company. The Gas Company, finding their field of operations likely to be seriously invaded, resolved upon the purchase of a small plant. Negotiations were finally completed for the purchase of the Thomson-Houston plant. A new station was immediately erected by them, in which power for 150 lights was established, and the battle was carried on with renewed vigor. The result has been an absolute surrender on the part of the Construction Company, they accepting a very small figure for their poles and wires, withdrawing their dynamos and lamps and otherwise disposing of a splendid steam plant which had cost nearly $15,000.

Since their withdrawal the gas company has advanced the price of lights to an average of $10 per month, which, considering the fact that wood is worth $5.50 per cord in front of the boilers, is little enough. They have lost a few consumers, but instead of the widespread dissatisfaction which is said to exist at their action, they find themselves forced to increase the present capacity of the plant to provide for new patronage offered. This is the first instance of this nature upon the coast, and may have a tendency to make the business of installing plants in the smaller cities of the coast more profitable, the practice having been heretofore to cover the field regardless of local support.

The East Berkeley Electric Light Company have contracted with the Indianapolis Jenney Company to erect a 60 light plant. As the town trustees are not empowered to provide money for the purpose of lighting the town under the present charter, the plant must be operated on funds raised by subscription until authority can be granted the trustees by act of the legislature, which meets in December, 1888.

In connection with the above it may be of interest to agents of competing companies looking towards California as "the land of gold" to know that seven bids were offered by as many different systems in response to the request of the company, which gave each bidder specifications to base his bid upon. When the bids were presented, the directors went into executive session and opened the tenders, much to the disgust of six of the seven agents, who volunteered to tell each other their bids, but the seventh man could not be made to tell, consequently the contract price for the plant is not known.

THE TELEGRAPH.

Western Union.—The total of Western Union stock is 862,000 shares of a par value of $86,000,000.

American Cable.—The stock of the American Cable Company, amounting to $14,000,000, has been relisted by the New York Stock Exchange. The property is under lease to the Western Union Company for 43 years from June 1, 1881.

The Big Cabling Feat.—Mr. C. R. Miller, of the New York *Times*, has written as follows to Mr. G. G. Ward, the general manager of the Commercial Cable Company: "Permit me to thank you for the interest you manifested yesterday to secure for the *Times* a rapid transmission of Mr. Swinburne's tragedy by cable from London. I wish to express, also, the great satisfaction of the *Times* with the service of your company. The 10,000 words which came to us over the Commercial Company's lines were received in about five hours, and were transmitted with such remarkable accuracy that only one verbal correction was sent to us by your operator. It was a marvelous feat of ocean telegraphy."

THE TELEPHONE.

New Orleans, La.—The Great Southern Telephone and Telegraph Company seeks to restrain the Southwestern Brush Electric Light and Power Company from using its poles or crossing its circuits, or coming within four feet of them. Various allegations as to danger are made in the bill for injunction.

Output of Instruments.—The monthly statement of the American Bell Telephone Company is as follows:

Month Nov. 20.	1887.	1886.	Increase.
Gross output	4,330	3,340	990
Returned	2,667	1,825	842
Net output	1,673	1,515	148
Since Dec. 20.	1886-87.	1885-86.	
Gross output	48,670	38,360	10,310
Returned	24,695	18,238	6,457
Net output	23,975	20,122	3,853

THE ELECTRIC LIGHT.

Victoria, Tex., is to have a Thomson-Houston plant.

Bristol, Tenn., is likely soon to have a Thomson-Houston plant, it is said.

Morristown, Tenn.—It is said that a plant will soon be put up at Morristown.

Asheville, N. C.—The Asheville Electric Light Company are increasing their plant.

Jacksonville, Fla.—A plant is to be put in for the Sub-Tropical Exposition Company.

Montpelier, Vt.—The Standard Company is putting in a new 500 light incandescent machine.

San Angelo, Tex.—It is proposed to put in an electric light plant in connection with the water-works.

Waterville, Me.—The Waterville Electric Light Company has increased its capital from $15,000 to $30,000.

Boston, Mass.—The Boston Electric Light Company has just ordered another Armington & Sims engine of 80 h. p.

Raleigh, N. C.—The Thomson-Houston Company at Raleigh is increasing its plant and putting in a new 80 horse-power engine.

Passaic, N. J.—The Passaic City Light, Heat and Power Company, recently organized, has applied for power to run its circuits.

Goodson, Va.—Mr. H. H. Corson, representing the Thomson-Houston system, will, it is expected, shortly put in a plant at Goodson.

Thomaston, Conn.—The Thomaston Electric Light Company has been incorporated by A. Thomas and others, with a capital stock of $20,000.

Baltimore, Md.—Mr. Samuel T. Williams, 477 North street, Baltimore, Md., writes to the *Iron Age* that he has just supplied the first engine built in Baltimore for electric lighting purposes.

Pawtucket, R. I.—The Pawtucket (R. I.) Gas Company is putting up a new building at Central Falls, and repairing its old buildings, for the purpose of introducing an electric light plant.

Rome, Ga.—It is stated that Mr. W. C. Huff, representing the Schuyler Electric Light Company, of Hartford, Conn., has been negotiating the removal to Rome of the plant now at Atlanta.

Nashville, Tenn.—The incorporators of the new Jenney Electric Light and Power Company at Nashville are: A. C. Green, W. H. Smith, A. L. Landis, Sr., F. A. Cummings and J. G. Ayderholt.

Rutland, Vt.—The Rutland Electric Light Company is trying to raise $25,000 for the purpose of increasing its plant. The company wishes to put in a new engine and boiler and three additional dynamos.

Baltimore, Md.—Thomas J. Shryock, Francis P. Stephens, William H. Crawford, Robert Turner, John H. Fowler, William A. Dunn and Solomon Strauss have incorporated the American Electric Company, of Baltimore, with a capital stock of $300,000.

Baltimore, Md.—Samuel H. Tagart, George R. Berry, James D. Mason, Jr., Hugh B. Hanna and Charles Cugle have incorporated the Thomson-Houston Electric Light Company, of Baltimore, with a capital stock of $200,000. Mr. Tagart is president of the company.

Bonds for a "Bunco Steerer."—A bunco steerer secured a victim at Cambridge, Mass., last week in the usual way, and was given three bonds for $1,000 each of the Edison Illuminating Company, of Brockton. He has since disappeared, and the bonds have not yet been traced.

Loomis Plants.—A private electric light plant is being installed in the residence of C. Bush, Pomfret, Conn., of seventy-five incandescent Loomis lights. The Fitchburg Worsted Company has contracted with the Loomis Company for electric lights in its new mill at Fitchburg.

Corsicana, Tex.—Mr. J. E. Whiteselle, recently reported as enlarging his electric light plant, has, with Joseph Huey, James Garrity and W. J. McKie, incorporated the Corsicana Electric Light and Power Company. The capital stock is $50,000. We gave details of the plant recently.

New York City.—The East River Electric Light Company has obtained a 99 years' lease of the seven story buildings and boiler house in the block bounded by the East River, Twenty-fourth and Twenty-fifth streets and First avenue, belonging to the estate of C. W. Durant. The lease was effected by Ludlow, Day & Co.

Westinghouse Plants.—The Westinghouse Electrical Company, of Pittsburgh, before the middle of November had contracted to furnish plants for over 20,000 lights in various parts of the country. Contracts were made recently to construct a plant for 2,600 lights in Albany, N. Y., and a similar plant in Columbus, Ohio.

Ottawa, Can.—No fewer than 1,000 Weston incandescent lights are now in successful operation on the commercial circuits of the Canadian Electric Light Company, at Ottawa, Can., and additions are being made daily. The long-distance system of the United States Company, represented in Canada by Ahearn & Soper, Ottawa, is used.

Manchester, Conn.—The electric lights are now in operation in Manchester. The Village Improvement Society will soon displace several of the lamps now in use by electric lights. The Mather Company offer to supply power, not exceeding a limited amount, to any small manufacturing concerns located within a half mile of their factory.

Washington, D. C.—The District Commissioners of Washington, D. C., have ordered the erection of thirty-four additional electric lights. When these have been erected there will be 108 electric lights in use, and the cost of erecting and maintaining them will have consumed the appropriation of $20,000 made by Congress for this purpose.

Pawtucket, R. I.—The Pawtucket Gas Company, Pawtucket, R. I., have ordered an Armington & Sims Company engine and two tubular boilers to be set with the Jarvis patent boiler setting to burn coke and coke screenings for fuel. The Jarvis Engineering Company have the contract for the entire plant, which is intended for electric lighting.

Freeman, Mo.—The Freeman (Mo.) Wire Company has just installed a complete electric light plant in its works, furnished by the Western Electric Company of Chicago. Its dynamo not only runs the lights in its own extensive factories, but those in the neighboring works of the Todd Pulley and Shafting Company as well, which have just been put up.

Painesville, O.—A fire which originated in the dust-room of the skewer factory in Painesville, O., extended to and completely destroyed the machinery and dynamos of the Electric Light Company. The dust from the saws was blown into an apartment near the boilers and had accumulated for several days, when it ignited and exploded, blowing off the roof of the building.

Leicester, Mass.—A stock company has been formed at Leicester to introduce electric lights into the various factories and the houses of some of the citizens. Work is to be begun at once. Power is to be furnished by Messrs. Sargent, of the Leicester Wire Company. The incandescent lamps to be used are of the Thomson-Houston system.—*Manufacturers' Gazette.*

Santa Barbara, Cal.—The annual meeting of the Santa Barbara Electric Light Company was held on Nov. 5. The plant is now worth one-third more than it cost. The company has in operation 95 arcs and 26 incandescents, and is developing a profitable business. The officers for the year are: S. W. Backus, president; C. Fernald, vice-president; W. M. Eddy, treasurer; and L. W. Sanborn, secretary.

Washington, Kan.—The Washington Electric Light and Power Company has a capital stock of $12,000, of which $8,000 is paid up. It has an exclusive franchise of 21 years for all purposes for which electricity can be used in lighting, heating and power supply. It is using both arc and incandescent lights. Its plant comprises Western Electric dynamos and Westinghouse automatic engine. Mr. A. W. Moore is the president.

Fremont, O.—The Fremont Electric Light and Power Company has been incorporated with a capital stock of $20,000. It has secured a city franchise and a contract for street lighting. It will put in the Thomson-Houston system and will turn on the light Jan. 1, 1888. The officers chosen are: D. A. Rauck, president; Mr. Heim, vice-president; H. E. Woods, secretary and treasurer. Mr. Rauck is cashier of the Farmers' Bank, of Fremont.

Vienna, Austria.—The great opera-house at Vienna had to be closed recently because of a breakdown in the electric light apparatus, caused by the cracking of the plates in the boilers, which were of Austrian manufacture. A complete new plant of boilers, amounting to 750 horse-power, has been ordered of the Glasgow house of the Babcock & Wilcox Company, and it is expected that they will be ready for service in two weeks from the date of the order, which, if accomplished, will be remarkably quick work.

Ashland, Ky.—The Ashland Electric Light and Power Company met on Wednesday, Nov. 23, and organized with a capital stock of $10,000. Mr. E. M. Roberts was elected president and general manager, and Mr. F. B. Moore secretary and treasurer, they being directors with F. M. Brooks, I. N. Pollock and J. L. Kouns. A contract has been placed with the Waterhouse Company, of Hartford, for a 30-light machine, full 2,000 c. p., for city lighting, and one machine of 30 1,200 c. p. lights for commercial service. It is expected to have the plant in operation in thirty days.

Taylor Engines for Electric Light Plants.—The Taylor Manufacturing Company, of Chambersburg, Pa., have recently sold the following Beck horizontal automatic engines for electric light plants: An 18½ × 24 engine, 227 h. p., for the Thomson-Houston station at Augusta, Ga.; a 11½ × 15 engine, 83 h. p., to the Wissahickon Electric Light Company, Philadelphia, Pa.; a 10½ × 12 engine, 67 h. p., for the Honesdale Electric Light Company, Honesdale, Pa.; a 9½ × 12 engine, 57 h. p., for the Kearney (Neb.) State Industrial School; a 10½ × 12 engine, 67 h. p., for the Sturgis (Mich.) Gas and Electric Light Company.

Birmingham, Ala.—The Edison Electric Illuminating Company, at Birmingham, has now been running about three months, and has every light placed that it can supply. The town is growing rapidly, and the company will shortly add a 150 h. p. engine and two No. 20 dynamos. The plant was installed by the Marr Company, through Mr. Spencer, its electrician. Its two Taylor engines are reported to "work and govern beautifully." The plant is altogether one of the finest in the South, and the company claim that it is not equaled. Mr. Leigh Carroll is president of the company, Mr. J. W. Carroll secretary, and Mr. H. K. McKay electrician.

Wheeling, W. Va.—The new station of the Wheeling Electrical Company was started on Nov. 1. It comprises two 650 light Westinghouse alternating dynamos, two double-cylinder engines, upright, of 150 h. p. each, and two batteries of two boilers each. The size of the station is 66 × 110 feet. The company will shortly place two 80 h. p. Van Depoele generators for driving motors on the new electric railway now being built by a stock company, called the Wheeling Railway Company and using the Van Depoele system. The lighting company will supply the prime power. Natural gas is used for fuel under the boilers. Mr. J. B. Garden is the secretary of the company.

Kankakee, Ill.—The Kankakee Electric Company, which was incorporated recently, as noted, has a contract with the city for street lighting. It is using Western Electric dynamos and lamps. It is now getting ready to light public and private buildings with arc and incandescent lamps, and has already secured the principal business houses for arc lighting. Mr. W. S. Reed, the manager, says: "Our machinery is as good as could be purchased. Our engine is the largest in this (Kankakee) county, and, all in all, this is one of the best plants in the West. The citizens claim to have one of the best lighted cities in the country." Efficient service will always win encomiums from an impartial public.

Geneva, N. Y.—The Geneva *Gazette* of Nov. 4 says: The new station of the Brush-Swan Electric Light Company in this village is completed, and by to-night the engines and dynamos will be in place. One engine and dynamo were set on Wednes-

day, and the commercial lighting has been furnished from the new station since that day. We doubt if there is a better or more convenient electric light station in the State, and with 150 horse-power boilers, two powerful engines and three dynamos, this company is now prepared to furnish all the lighting, public, private and commercial, with arc or incandescent lights which may be be needed. There is an independent circuit for the private and commercial lights, which being shorter than the circuit for the street lights is more easily kept in perfect order, insuring a steady and perfect light. The new dynamo is larger and of much greater capacity than the old one, and is capable of furnishing the current for at least 450 incandescent lights, while the station is so arranged that its capacity can be easily increased at any time. Mr. Charles H. Avery, the superintendent of the plant here, is a very careful, painstaking and competent gentleman, and we can easily assure the people of Geneva the most magnificent and powerful light for the street lamps and private lamps in the future.

APPLICATIONS OF POWER.

Memphis, Tenn.—The Memphis City Railway Company has decided to run its cars by electricity.

Lebanon, Pa.—The Electric Street Railway Company, of Lebanon, has been refused a charter to build a line of railway in that city, the ground for the refusal being that one line of railway there is enough.

Portsmouth, Va.—The Suburban & City Railway and Improvement Company, which has applied to the city councils for permission to lay tracks, &c., will begin construction as soon as the privilege is obtained. It expects the concession within a month.

Easton, Pa.—The track for the Easton electric railway is just about completed and is about one mile long. The Daft system is used with overhead wires. Two cars are to run at first. The grade at one point, for 1,200 feet, is 9 per cent. The gauge is 5 feet 2½ inches. On the heavy grade a 56-pound T-rail is used, with 30-pound T-rail over the rest of the road. The officers of the Lafayette Traction Company, running the road, which goes into operation Dec. 15, are: J. M. Young, president; and D. W. Nevin, secretary and treasurer.

PERSONALS.

Mr. Wm. Stanley, Jr., electrician to the Westinghouse Electric Company, is to read a paper before the American Institute of Electrical Engineers on Tuesday next, Dec. 6, on certain lines of investigation connected with alternating currents. The subject is one to which Mr. Stanley has devoted much time and attention, and it will be exceedingly interesting to learn the results he has arrived at. The meeting will be held at the House of the American Society of Civil Engineers, 127 East Twenty-third street, at 8 P. M.

Mr. A. Devitt, a well-known carbon man, now representing the Globe Carbon Company, of Cleveland, has been a recent visitor to New York. He reports a very active demand for the product of the factory, which has an output of 10,000 per day, and it is proposed to increase the facilities.

Prof. A. G. Bell.—A Washington dispatch says: For several months Professor Bell has been going deep into his researches on the subject of hereditary deafness. He has conducted a wonderfully large correspondence with people in all parts of the world to hunt up every scintilla of evidence necessary to trace out genealogies. He will eventually make public his discoveries, showing hereditary deafness in the same line of descent for 200 years. The professor has also constructed a valuable machine for talking with deaf mutes. It is something like the typewriter in theory, having a keyboard which turns up big plain letters in such a way as to construct a word, and so facilitate conversation. The professor exhibits no anxiety as to the decision of the Supreme Court in the pending telephone suit, but has a firm conviction that it will soon be decided in his favor. Every few days he receives word of some new claim to the invention of the telephone. The latest claim was from a New England drummer, who insists that he told Professor Bell all about the telephone when he and Bell were commercial travelers together. As Professor Bell never was a commercial traveler, he doesn't remember the other fellow.

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolt cap and set screws, taps, dies, files, twist drills, brass and rubber tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

This company controls all the Patents for Arc Lighting issued to Chas. F. Brush, of Cleveland, for the New England States, New York, Pennsylvania, New Jersey, Delaware, Maryland, and the District of Columbia, also the Swan Patents for the same territory.

THE BRUSH SWAN ELECTRIC LIGHT CO.,
OF NEW ENGLAND,
204–210 Elizabeth St.,
NEW YORK, Nov. 9, 1887.

The Electrical World, New York:

GENTLEMEN.—In reply to a card in your paper of the Brush Electric Co., of the 5th inst., we hereby notify all persons who are using or contemplate using the Brush system in this territory, that until the issues between the two companies are decided by the *Courts*, all payments for Brush-Swan Machinery, and all orders for the same, must be made to this company.

BRUSH SWAN ELECTRIC LIGHT CO.,
of New England.
G. MCFALL, Secretary.

The Brush Electric Co.—NEW YORK, Nov. 5, 1887. Dear Sir: Our contract with the Brush-Swan Electric Light Company, of New England, has been terminated, and we have resumed control of the territory formerly occupied by it. Hereafter we will fill orders directly for parties residing in said territory, and all correspondence should be directed to the Brush Electric Company, P. O. Box No. 1,772, New York City. No orders will be recognized by us hereafter coming through the Brush Swan Electric Light Company, of New England.

THE BRUSH ELECTRIC COMPANY.
By Wm. F. Swift, Secretary.

Fire Alarm in Hotels.—At the fire in the Saratoga Hotel recently the alarm was given from the office to the guests in their rooms by the Fire Alarm and Guest Call put in by the Western Electric Co., "and many lives were saved thereby," the architect of the building says.

The following letter in regard to the Western Electric Co.'s hotel apparatus testifies to the merits of this system:

ST. LOUIS, Mo., Oct. 28, 1887.

Western Electric Co., Chicago:

GENTLEMEN: Please find inclosed my check for payment of the accompanying bill.

Permit me to say that the system is working with admirable success, and is giving excellent satisfaction. I am much pleased with its introduction into my hotel, and pay this bill with much cheerfulness, believing that I am getting full value received for the money.

Yours truly,
(Signed) J. L. GRISWOLD.

MISCELLANEOUS NOTES.

Detroit, Mich.—The Detroit Insulating Clothing Company, of Detroit, has been incorporated by L. Mason and others, with a capital stock of $20,000.

New York City.—The New York Electric Construction Company, of New York, has been incorporated by A. L. Soulard and others, with a capital stock of $50,000.

Electro-plated Ware.—The Morgan Silver Plating Company, of Winchester, Conn., has been incorporated by J. T. Morgan and others, with a capital stock of $25,000.

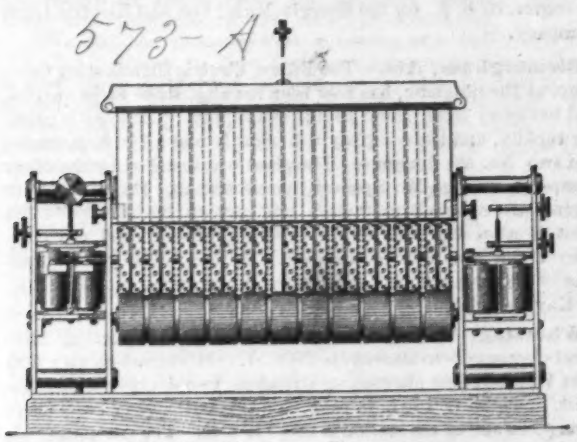
The Carpenter Brake.—The Carpenter Automatic Electric Air-brake Company has been incorporated at Chicago by R. E. Beebe, W. H. Wiswell and E. F. Lawrence, with a capital stock of $1,000,000.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED NOVEMBER 22, 1887.

373,435. Galvanic Battery; Horatio J. Brewer, New York, N. Y. Application filed Feb. 19, 1887. The cell has a part cover permanently secured to it, and provided with an aperture for the passage of the positive electrode. A plate, which divides the cell, is placed in an inclined position, one of the compartments of the cell being thus made larger at its upper end to form a sufficient space for the head of the negative electrode and to admit of conveniently packing the negative material around the negative electrode.

373,452. Insulating-Joint or Pipe-Coupling; Emil F. Gennert, Brooklyn, N. Y. Application filed July 14, 1887. The object of the invention is to make a coupling that has few parts and that will not allow a short circuit when the usual ceiling-plate or box-plate is put in place. It is also designed to relieve the insulating material from strain and from liability to displacement. To serve these ends the lower or outer coupling half is provided with a male thread for attachment to a fixture and with a cup-shaped flange within which a flange

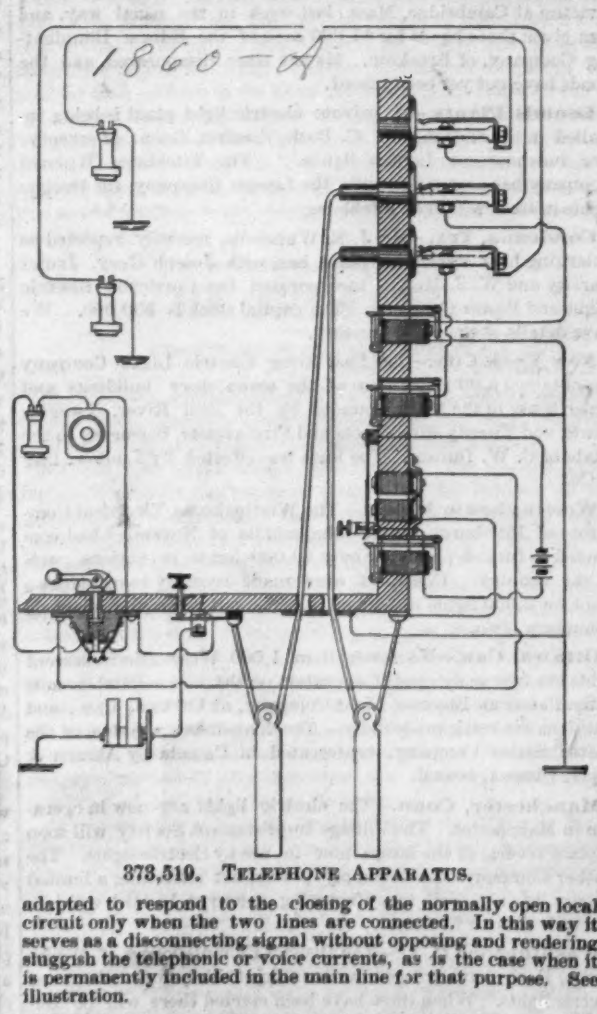


373,508. PRINTING TELEGRAPH.

upon the inner coupling half is held, the latter having a female thread for attachment to the usual pipe. The two halves are secured together with interposed insulation, the means of attachment being screws whose advance is limited by a metallic portion of the cup. See illustration.

373,508. Printing Telegraph; Charles J. Wiley, Brooklyn, N. Y. Application filed May 2, 1887. The object of the invention is to provide means for keeping the prices of various stocks, commodities, etc., separate from each other, so that the quotations of each will be separate from all the rest, and can be read easily. The quotations of each commodity are printed in a separate line, thus enabling an operator to make a comparison of the quotations of any special commodity, and providing a record which can be filed away for future reference. Several type wheels are mounted upon a shaft, each wheel being used to print the quotations of one stock or commodity. The printing is done upon one broad band of paper upon which quotations appear in columns side by side, with the name of the commodity indicated at the beginning of each column. There are some novel features about the type wheels and the arrangement of the characters thereupon. See illustration.

373,519. Telephone Apparatus; Isaiah H. Farnham, Malden, Mass., Assignor to the New England Telephone Company, New York, N. Y. Application filed April 2, 1887. The invention consists in combining with the inter-connecting devices and call-receiving annunciators of a main telephone line a normally open local circuit including a source of electricity and a relay of extremely low resistance, either permanently included in the main line or brought into contact therewith only when two lines are united for intercommunication, the relay being adapted to attract a light armature acting as a circuit closer for the local circuit. This circuit, when closed, is adapted to operate the call-receiving annunciator, the latter being common both to the main line and to the normally open local circuit, being in circuit normally with the former and adapted then to indicate the subscriber's call, but being disconnected therefrom by the act of connecting two lines, and thereupon



373,519. TELEPHONE APPARATUS.

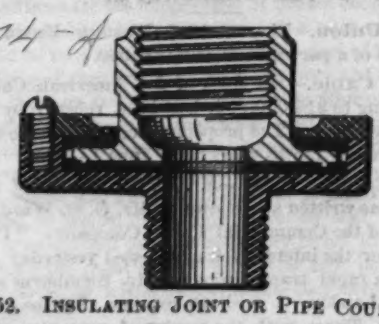
adapted to respond to the closing of the normally open local circuit only when the two lines are connected. In this way it serves as a disconnecting signal without opposing and rendering sluggish the telephonic or voice currents, as is the case when it is permanently included in the main line for that purpose. See illustration.

373,584. Dynamo-Electric Machine; Thomas A. Edison, Llewellyn Park, N. J. Application filed Dec. 28, 1886. The inventor avoids sparking at the commutator by making each connection from the armature coils to the commutator through an extra coil revolving in an extra field of force. The extra coils are so arranged that at the moment of bridging two commutator blocks one of the extra coils is in a condition to generate an electromotive force contrary to that in the short circuited armature coil. When the short circuit is broken, the discharge and spark due to such breaking are prevented.

373,691. Apparatus for Purifying and Separating Fatty Substances by Electricity; Heinrich F. D. Schwahn, Kansas City, Mo. Application filed Dec. 8, 1886. Steam inlet pipes enter a closed cylinder at opposite sides and form axles for it, which are mounted on the pipes and travel on rails. Inside the cylinder is a perforated cylinder, and within that is a boiler containing an electric separator that has suitable battery connections.

373,739. Prevention of Sparking in Electric Motors and Generators; Daniel Higham, Philadelphia, Pa., Assignor to the Higham Electric Motor Company, same place. Application filed May 9, 1887. The field magnet pole pieces project and alongside these pole pieces electro-magnetic coils are placed, each coil being wholly on one side of the armature and acting on poles of opposite sign. By these means the non-sparking points of the commutator cylinder of the armature are automatically maintained without shifting the commutator brushes.

373,759. Electric Coupling; George N. Taylor, Leavittsburg, Ohio. Application filed April 20, 1886. This is an electric coupling forming part of an air brake coupling on railway



373,452. INSULATING JOINT OR PIPE COUPLING.

cars. The latter coupling consists of two like counter parts, each adapted to be secured to an air conducting tube or hose, a stationary plate and a movable plate secured to the outside of each section of the coupling. Wires to form an electric circuit are secured to the movable and stationary plates. The circuit is always closed at the rear of the train, being automatically completed whenever a car is cut off.

373,761. Electric Arc Lamp; Gustav A. Wiese, San Francisco, Cal., Assignor to Adolph Weske, same place. Application filed March 22, 1887. The invention covers the details of automatic regulating and cut-out devices and also provides means for bringing the carbons of a double lamp into circuit so as to burn successively and continuously.

373,767. Device for Attaching Tablets to Telephones; Howard H. Butler, Canton, Ohio, Assignor of one-half to Charles G. Cook, same place. Application filed May 24, 1886. Renewed Oct. 29, 1887. This is a device holding writing sheets or tablets to a telephone desk or shelf. It consists of a retaining or clamping plate with a groove and a spring that has hooks at its ends for catching under the edge of the shelf, the spring resting in the groove and holding the plate down upon the sheet or tablet.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.